CGIAR

Annual Report

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CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH



Prologue



Boutros Boutros-Ghali, Secretary General of the United Nations, on the occasion of the CGIAR Ministerial-Level Meeting, beld in Lucerne, Switzerland in February 1995. hungry and malnourished, and their number is growing. Over-population and poverty combined take their toll on the environment. Thus the transformation of agriculture in the developing world to combine productivity growth and the sustainability of natural resources is essential. Through international cooperation on agricultural research, we can break the hold of rural poverty, feed the hungry, and protect the environment.

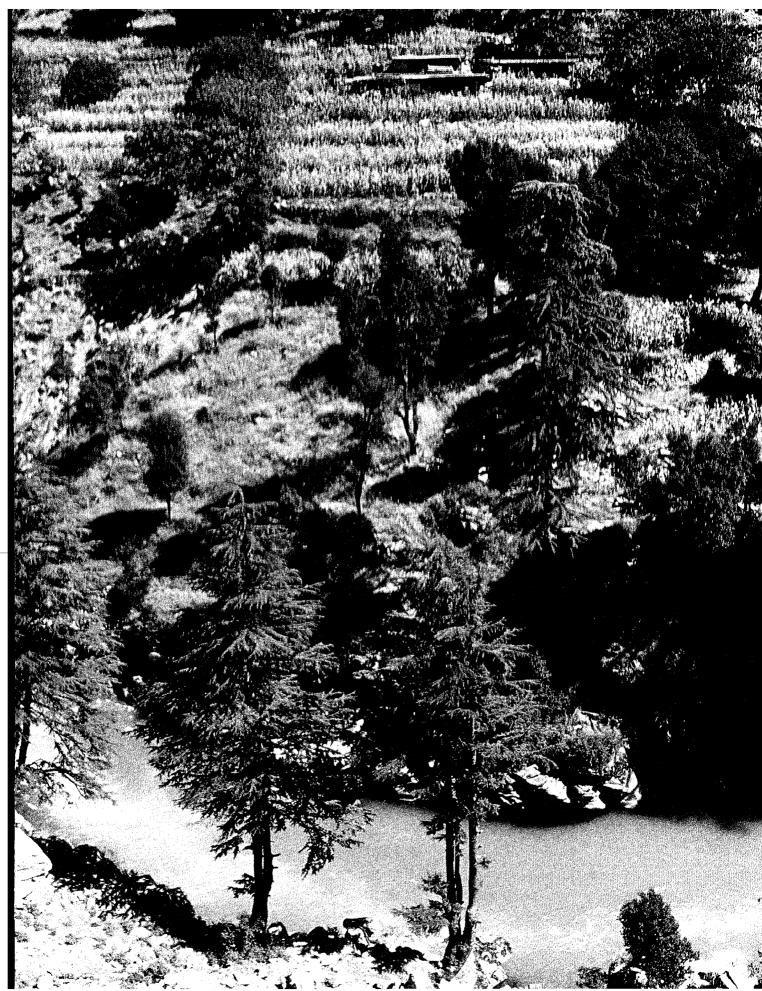


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Boutros Boutros-Ghali, Secretary General, United Nations

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EPILOGUE

Ismail Serageldin, Chairman, CGIAR



List of Acronyms

CGIAR Consultative Group on International Agricultural Research

CIAT Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)

CIFOR Center for International Forestry Research

CIMMYT Centro Internacional de Mejoramiento de Maiz y Trigo (International Center for the

Improvement of Maize and Wheat)

CIP Centro Internacional de la Papa (International Potato Center)

FAO Food and Agriculture Organization of the United Nations

ICARDA International Center for Agricultural Research in the Dry Areas

ICLARM International Center for Living Aquatic Resources Management

ICRAF International Centre for Research in Agroforestry

ICRISAT International Crops Research Institute for the Semi-Arid Tropics

IFAD International Fund for Agricultural Development
IFPRI International Food Policy Research Institute
IIMI International Irrigation Management Institute
IITA International Institute of Tropical Agriculture
ILRI International Livestock Research Institute

IPGRI International Plant Genetic Resources Institute

IRRI International Rice Research Institute

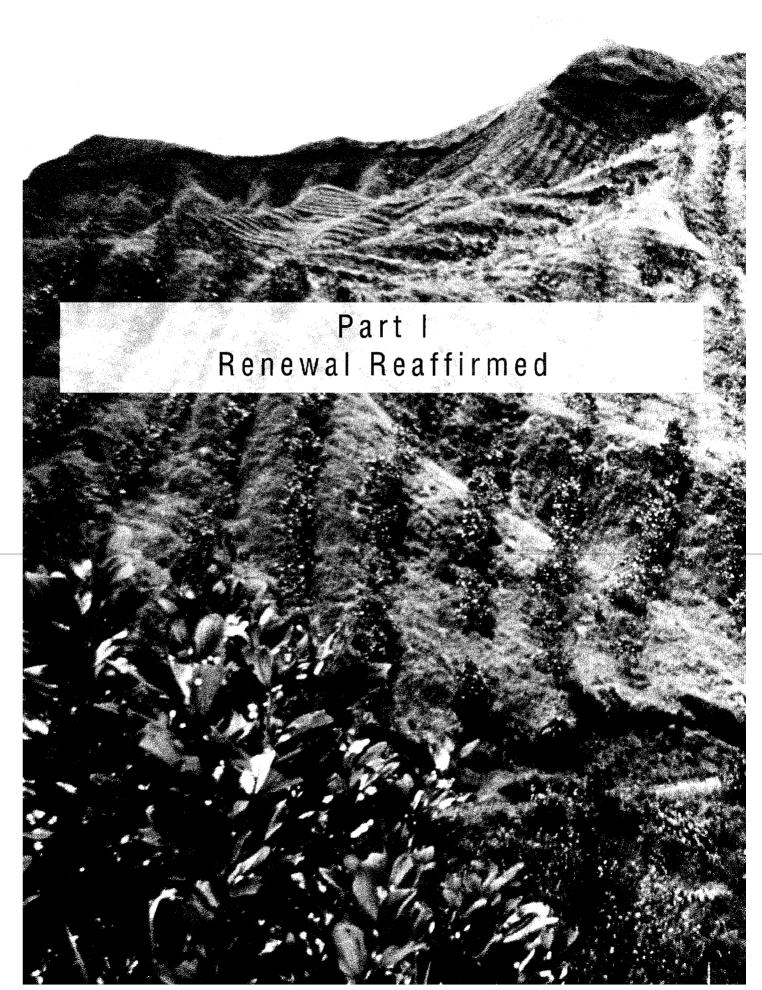
ISNAR International Service for National Agricultural Research

NARS National Agricultural Research Systems

NGOs Non-Governmental Organizations

TAC Technical Advisory Committee of the CGIAR UNDP United Nations Development Programme UNEP United Nations Environment Programme WARDA West Africa Rice Development Association

Note: All financial data included in this Annual Report are reported in US dollars (\$).



About the CGIAR



A gricultural research was placed on the front lines in the battle against hunger and poverty when the CGIAR was established in 1971. The CGIAR has grown to 49 members supporting 16 International Agricultural Research Centers dedicated to promoting sustainable agriculture for food security in developing

countries. Productivity and natural resources management are the twin pillars of CGIAR research on food crops, forestry, livestock, irrigation management, and aquatic resources, and in its services to national agricultural research systems in developing countries. Its research covers commodities that provide 75 percent of food energy and a similar share of protein requirements in developing countries.

Productivity and natural resources management are the twin pillars of CGIAR

twin pillars of CGIAR research on food crops, forestry, livestock, irrigation management, and aquatic resources, and in its services to national agricultural research systems in

developing countries.

Research supported by the CGIAR has helped to:

- increase the supply of basic foods in the developing world;
- preserve the world's heritage of plant genetic resources; and
- reshape and strengthen scientific capacity in developing countries.

Over the next 20 years, the CGIAR will focus on five major research thrusts.

Increasing Productivity. The CGIAR strives to make developing country agriculture more productive through genetic improvements in plants, livestock, fish, and trees, and through better management practices. One important feature of the CGIAR's productivity research is its focus on building into plants greater resistance to insects and diseases that adversely affect productivity and the stability of production in the tropics. While protecting farmers from losses, these improved plants protect the environment because they reduce the need for chemical controls.

Protecting the Environment. Conserving natural resources, especially soil and water, and reducing the impact of agriculture on the surrounding environment are an essential, and growing, part of the CGIAR's

efforts. The CGIAR plays a leading role in developing new research methods to identify long-term trends in major agricultural environments, and in developing solutions to pressing environmental problems.

Saving Biodiversity. The CGIAR holds in trust for the future one of the world's largest ex situ collections of plant genetic resources, containing over 600,000 accessions of more than 3,000 crop, forage, and pasture species. The collection includes improved varieties and, in substantial measure, the wild species from which those varieties were created. Duplicates of these materials are freely available to researchers around the world so

that new gene combinations can be brought to bear on current problems. The CGLAR was the first to place its collections under the auspices of FAO as the basis of an international network of *ex situ* collections.

Improving Policies. Agricultural producers are heavily influenced by public policy. The CGIAR's policy research aims to help streamline and improve policies that strongly influence the spread of new technologies and the management and use of natural resources.

Strengthening National Research. The CGIAR is committed to strengthening national agricultural research in developing countries

through side-by-side working relationships with colleagues in national programs, strengthening skills in research administration and management, and formal training programs for research staff.

Invigorated by the momen tum of its program of renewal and rededication in 1994 and 1995, the CGIAR looks to the future with greater openness and solidarity with its partners than ever before as a fully South-North enterprise capable of fulfilling a global vision of less poverty in the world; a healthier, better nourished human family; reduced pressure on fragile natural resources; and people-centered policies for sustainable development.



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Introduction



Alexander von der Osten Executive Secretary CGIAR

For the CGIAR as a whole, the period covered by this

Annual Report was one of steady progress in reaching the goals of a program of renewal designed to ensure that the CGIAR Centers would be fully supported to continue their efforts and improve on them.

Each of the centers of excellence supported by the CGIAR publishes Lits own annual report, portraying the efforts and achievements of international scientists seeking solutions to some of the most pressing problems of the world's poor. The Annual Report published by the CGIAR Secretariat seeks to complement the Center reports by presenting a broader perspective which takes into account events and trends across the various components that together constitute the CGIAR System.

To recapitulate briefly, production in developing countries would be poorer by several 100 million tons per year of staple food crops without CGIAR-supported research. Thus, the work of CGIAR scientists has made it possible for food requirements to be met in regions where scarcity or famine were once widespread. Research into natural resources management, the maintenance of biodiversity, food policy, and capacity building are of similar global significance. Research-based agricultural growth, moreover, has served as a vital catalyst of economic development in broad terms.

For the CGIAR as a whole, the period covered by this Annual Report was one of steady progress in reaching the goals of a program of renewal designed to ensure that the CGIAR Centers would be fully supported to continue their efforts and improve on them. The defining characteristic of the renewal program is change based on continuity.

The need for change is governed by many factors. An important consideration is the fact that the tasks and targets of agricultural research are today more complex than the goals of increased food productivity which the CGIAR set for itself at its founding. There is a greater awareness and acceptance of the need to balance productivity



gains with natural resources management. This requires renewed emphasis on a cluster of sustainability issues, such as unrestricted access to genetic resources, management of tropical forests, research into the productive use of marginal lands inhabited by the poor, and food crop improvements that are combined with environmental conservation. We know, too, that agricultural development is affected by the need for capacity building, questions of governance, and other policy issues.

The record of the CGIAR System demonstrates that research, national and international, helps to create the tools and technologies needed to address these issues. As we reach out for a better understanding of the complex interactions among physical, biological, and social systems, research can enable the international community to construct a new agricultural regime that is global, development-oriented, equitable, and sustainable.

Mobilizing science for this task requires rededication by the

international community to wholehearted support of agricultural research as an instrument of development; as well as significant public investment in research, both national and international. These are the guiding principles of continuity based change within the CGIAR System.

The founding characteristics on which the CGIAR was built represent the bedrock of continuity that the System maintains, whatever changes it undertakes. These attributes include a sharp focus on research, an unremitting commitment to scientific excellence, and a collegial approach to decisionmaking. The changes pursued by the CGIAR System are meant to improve its efficiency and effectiveness; strengthen its collaboration with a broad range of partners, including developing country scientists, NGOs, and the private sector; harmonize its goals with those of the international development community; and bring about its emergence as a truly South-North enterprise.

The highlights of the program of change are recounted in this Annual Report. Our aim has been to capture the excitement engendered by the renewal program launched by the CGIAR in May 1994, the significance of the renewed commitment by the international community to using agricultural research as an instrument of development, and the challenges that lie ahead of the CGIAR System as it seeks to realize its full potential.

Much has been achieved. but more remains to be done. We are confident that the challenges ahead will be met, and that the CGIAR will continue to be actively engaged on the front lines in the battle against hunger and poverty for many vears to come.



Five Milestones on a Journey of Renewal



Ismail Serageldin Chairman, CGIAR

Excerpts from "Beyond Lucerne: From Decisions to Actions," Chairman's Opening Statement at the 1995 CGIAR Mid-Term Meeting, Nairobi, Kenya May 22-26.

What a journey it has been—a journey of hope, a journey of excitement, and, most of all, a journey of accomplishment.

A t the 1994 Mid-Term Meeting in New Delhi, India the CGIAR adopted an eighteen-month program of renewal. That program set up five milestones: the New Delhi consensus, International Centers Week 1994, the Lucerne Ministerial-Level Meeting, the 1995 Mid-Term Meeting, and International Centers Week 1995.

We are now—the 1995 Mid-Term Meeting in Nairobi—at the fourth of these five milestones on our journey of renewal. What a journey it has been—a journey of hope, a journey of excitement, and, most of all, a journey of accomplishment.

When we were approaching the first milestone—the Mid-Term Meeting in New Delhi a year ago—self-doubt gnawed at the CGIAR System. The vision of the System seemed to be unfocussed. Funding prospects were considered bleak. Dedicated staff in the Centers were demoralized. Our partners were bewildered. But our belief in the innate strengths of the System prevailed. We emerged from that meeting with single-minded determination to make the System work. Consequently, each of the targets of the 18-month timetable of change adopted and launched in New Delhi has been met. We have passed three milestones with no deviation; no time slippage.

The vision of the CGIAR has been refocussed. A renewed sense of confidence permeates the Centers. Research programs are being

carried out with heightened vigor. The research agenda of the System was fully funded in 1994 and will be fully funded this year as well. Ministerial-Level Meeting held in Lucerne on February 9 and 10our third milestone—reaffirmed the mission of the CGIAR as follows: to contribute, through research, to promoting sustainable agriculture for food security in the developing countries. In doing so, that historic meeting unequivocally reaffirmed the capacity of CGIAR-supported research to help in the alleviation of poverty and the protection of the environment.

Agriculture, thus, was clearly placed at the heart of the development paradigm. The development community's primary concerns in recent years have been issues connected with population growth, the environment, and food security. Agriculture is the interface that links

these three. At least in the fore-seeable future, none of these issues can be adequately dealt with unless sustainable agricultural growth is nurtured. Research is vital to this process, and the CGIAR, therefore, can make an unique contribution.

By an unfortunate irony, however, while confidence in the CGIAR as an instrument of development has been strongly reasserted, the development enterprise itself—a vital and indispensable endeavor in global terms-is under attack. The very idea of development cooperation between North and South is being assailed. So, while we can be justifiably proud of what we have achieved, we cannot be complacent. We must redouble our efforts not only on behalf of the CGIAR in the face of diminished development assistance budgets, but also on behalf of all the dedicated and successful efforts

of so many in the development community.

We must not allow the failure of politicized aid that was labeled as development assistance, or the occasional failed project of the past, to overshadow the success stories of real development, including such outstanding examples as the CGIAR. We must join forces with friends and allies to roll back the tide of doubt that threatens the world's development enterprise. If we fail, the worst hit victims will not be development institutions and the dedicated men and women within them. The real victims will be the weakest in human society—the poor, the hungry, the unemployed, and the marginalized. We must not fail. We will not fail.

As we face the future, we are strengthened by the wisdom of the decisions taken by the CGIAR under its program of renewal. If we had not done so already, we would today be scrambling around for the means by which to strengthen our partnerships, ensure the efficiency and effectiveness of the CGIAR, create greater transparency, and tighten our decisionmaking process. But we have already moved decisively in these directions. The high point in our quest for renewal was the Lucerne meeting, where the groundwork was put in place for broad revitalization. We are better positioned than before, therefore, to rise to all new challenges. The Spirit of Lucerne both refreshes and strengthens.



The Lucerne meeting was the highest level gathering of the CGIAR since the Bellagio Conference of 1971, which led to the establishment of the CGIAR. The legacy of Bellagio sustained the CGIAR for almost 25 years, enabling it to make substantial contributions to food production and food security in developing countries, most notably through the green revolution. In Lucerne, the CGIAR turned to its creators, the international community, once again, seeking reaffirmation of the purpose and guiding principles with which it could respond effectively to a new set of global challenges and a changing world situation. The response of the international community was forthright, supportive, and unambiguous.

South and North united behind a common cause. While continuing to acknowledge the inspiring role of the North in founding the CGIAR at Bellagio, and supporting it thereafter, I must point to the fact and the significance of the increasing participation of the South. Colombia, Côte d'Ivoire, Egypt, Iran, and Kenya-all new members at the New Delhi meetingattended the Lucerne meeting. The presence of developing country members in the CGIAR should not be viewed merely as an increase in numbers, however, for what it actually signifies is a profound sense of commitment.

In Lucerne, South and North were equally engaged in shaping an action program that



ICARDA

reflects compassion, wisdom, and confidence. Participants adopted a *Declaration and Action Program*, which demonstrates a clear commitment to addressing the challenges of promoting a people-centered sustainable development that helps feed the hungry, reduces poverty, and protects the environment, in the context of a rapidly expanding global population that places increasing demands on the Earth's fragile and finite natural resources.

Two companion volumes, the Summary of Proceedings and Decisions and the Background Documents on Major Issues, have been produced and arc being widely disseminated. These are historical documents. But the printed word alone,

effective as it is, cannot fully recreate the mood in Lucerne. In many years of participating in and presiding over international meetings connected with development, rarely have I seen a group coalesce behind a common purpose so effectively and quickly. Hope and confidence, tempered by realism, were abundant.

Let us recapture that mood in Nairobi, as we strive together to move beyond our fourth milestone and on to the fifth, International Centers Week later this year, thus successfully completing our eighteen month program of renewal and rededication, fully aware that this is just the start of the longer journey still to come in 1996 and beyond.

Lucerne Declaration and Action Program

A Ministerial-Level Meeting held in Lucerne, Switzerland in February 1995 was a key event in the CGIAR's program of renewal in 1994 and 1995. Participants in the Lucerne meeting adopted a *Declaration and Action Program*, providing the CGIAR with a reaffirmed mandate and broad guidelines for future action. As subsequent decisions taken by the CGIAR, which are covered in this Annual Report, were strongly influenced by the recommendations made in the *Declaration and Action Program*, the document is reproduced here for the convenience of readers.

The Lucerne Declaration

We, Ministers, Heads of Agencies, and Delegates representing the membership of the Consultative Group on International Agricultural Research (CGIAR):

Cognizant of the vicious circle of poverty, population growth, and environmental degradation that affects the world's poor;

Encouraged by the progress the world community is making in shaping a global agenda to deal with the urgent problems of the environment, population growth, social development, and the participation of women;

Mindful of the potential contribution of agriculture to development, particularly in alleviating the suffering of 1 billion people who live in abject poverty, most of them malnourished;

Aware that population growth in developing countries and rising incomes will double food demand by 2025, threatening the future food security of much of humanity and the integrity of the Earth's natural resources, especially soil and water, and biological diversity;

Convinced that the new knowledge and technologies generated by scientific research are necessary to meet the rising food demand in a long term sustainable way, from a limited and fragile natural resource base;

Recognizing the outstanding achievements of scientific research conducted by

CGIAR research centers which have raised the productivity of agriculture, forestry, and fisheries; thus contributing to the generation of rural income and employment, the lowering of food prices, and the alleviation of urban and rural poverty, while promoting South-North research partnerships:

Call for the renewal and reinforcement of this successful work, aimed now at the multiple challenges of increasing and protecting agricultural productivity, safeguarding natural resources, and helping to achieve people-centered policies for environmentally sustainable development:

Endorse the vision of the renewed CGIAR of helping to combat poverty and hunger in the world by mobilizing both indigenous knowledge and modern science, and through sharply focused research priorities, tighter governance, greater efforts at South-North partnership, and flexible financing arrangements, as an appropriate response to the challenges of the coming century; and

Affirm our strong support for the revitalized CGIAR as one of the main instruments of the world community whose contribution, in close partnership with other actors, is of considerable importance to the successful implementation of the emerging global development agenda.

The Lucerne Action Program

INTRODUCTION

Tinisters, Heads of Agencies, and Ministers, reads and Delegates endorse the thrusts and themes of the background studies prepared for their meeting. They welcome the United Nations Environment Programme (UNEP) as a cosponsor of the CGIAR. They reaffirm the strong need to ensure continuity of publicly funded research, complementing research conducted by the private sector, on problems of international significance in agriculture, livestock, forests, and aquatic resources. This reaffirmation is based on the need to help meet the food needs of the poor and on the contribution that agricultural research can make to poverty alleviation in the context of sustainable development. Although it is a small component of the global research system, the CGIAR has an important role to play as a catalyst and bridge builder.

BROADER PARTNERSHIPS

In the light of its position within the global agricultural research system, the CGIAR is encouraged to continue its efforts to develop a more open and participatory system with full South-North ownership.

Accordingly, the CGIAR is encouraged to:

- Continue to broaden its membership by including more developing countries as active members who participate fully in CGIAR deliberations;
- 2. Convene a committee of non-governmental organizations (NGOs) and a committee of the private sector as a means of

improving dialogue among the CGIAR, the private sector, and members of the civil society who are interested in the same issues as the CGIAR:

- 3. Accelerate the process of systematizing participation by national agricultural research systems (NARS) of developing countries in setting and implementing the Group's agenda (a specific action plan to do so is being prepared by the NARS and representatives of the CGIAR, and will be presented at International Centers Week 1995); and
- 4. Complete its transition from a donor/client approach to equal partnership of all participants from the South and North within the CGIAR System.

RESEARCH AGENDA

The mission of the CGIAR is to contribute, through its research, to promoting sustainable agriculture for food security in the developing countries.

Therefore, the CGIAR is urged to:

- 1. Conduct strategic and applied research, with its products being international public goods;
- 2. Focus its research agenda on problemsolving through interdisciplinary programs implemented by one or more international centers, in collaboration with a full range of partners:
- 3. Concentrate such programs on increasing productivity, protecting the environment,

saving biodiversity, improving policies, and contributing to strengthening agricultural research in developing countries;

- 4. Address more forcefully the international issues of water scarcity, soil and nutrient management, and aquatic resources;
- 5. Pay special attention to Sub-Saharan Africa and South Asia, which face the greatest challenges in cradicating poverty and malnutrition;
- 6. Ensure that research programs address the problems of the poor in less-endowed areas, in addition to continuing its work on high-potential areas;
- 7. Reinforce the series of notable actions already taken to protect the human heritage of genetic resources, *viz*:
 - a. placing the plant genetic resources collections of the CGIAR Centers under the auspices of the FAO Commission on Plant Genetic Resources;
 - b. creating a systemwide program on genetic resources; and
 - c. establishing a committee of experts to provide the CGIAR System with support and advice on all aspects of plant genetic resources policy;
- 8. Work in closer partnership and collaboration with public and private research organizations in the South, including farmer groups, universities, NGOs, and

- international institutions to design and conduct research programs;
- 9. Work in closer partnership and collaboration with public and private research organizations and universities from developed countries to design and conduct joint research programs; and
- 10. Ensure that the setting of its research agenda reflects the views and goals of global and regional forums on agricultural research.

GOVERNANCE

Collegiality and informality are important and durable assets of the CGIAR. Therefore, the CGIAR should not be established as a formal international organization, but could benefit from strengthening its decisionmaking processes and consultative mechanisms.

Toward this end, the CGIAR is requested to:

- 1. Retain overall decisionmaking powers in its general membership or committee of the whole, supported in this task by a Steering Committee and its component standing committees on Oversight and Finance as well as *ad hoc* committees established when necessary;
- 2. Ensure that scientific advice of the highest quality continues to be provided by the CG1AR's independent Technical Advisory Committee (TAC); and
- 3. Strengthen the assessment of its performance and impact by establishing an independent evaluation function reporting to the CGIAR as a whole.

FINANCE

Higher levels of investment in agricultural research are needed to meet the challenge for innovation and new technologies which can contribute to higher and sustainable agricultural production. To ensure a concentrated and sustained effort, investments must be expanded for all components of the global system at the national, regional, and international levels. As to the CGIAR, participants commit themselves to (i) consolidate current complementary funding into the main funding of the agreed agenda, and (ii) maintain the real value of the level of support and, wherever possible, to increase it. For those donors who can do so, multi-year commitments to the CGIAR would help to increase predictability and facilitate programming.

To ensure that support for the CGIAR is stable and predictable, members are urged to:

- 1. Institute a negotiation and review process, involving all members, to ensure full funding of the agreed research agenda;
- 2. Continue to use a matrix framework to articulate the CGIAR's programs and to serve as a benchmark for funding and monitoring CGIAR activities, thus enhancing transparency and accountability;
- 3. Provide their support to Centers, programs, or both to facilitate agreement on a financing plan which funds all components of the agreed research agenda fully; and

4. Disburse their pledged contributions as early as possible in the financial year, to ensure timely implementation of approved programs.

Meanwhile, the CGIAR is urged to:

- 1. Continue its efforts to expand its membership from both the North and the South;
- 2. Solicit the philanthropic financial participation of the private sector without compromising the public goods character of the CGIAR's research; and
- 3. Explore the feasibility of setting up a fund or a foundation which can seek contributions to support agricultural research.

Additionally, the CGIAR is encouraged to undertake research in Eastern Europe and in countries of the former Soviet Union. However, as more than a marginal effort will be required, such activities should be initiated only when a clear program of work where the CGIAR has a distinctive comparative advantage has been established, and a minimum level of separate and additional funding has been secured. For this purpose, the CGIAR should establish a separate fund to ensure no diversion or dilution of the current focus of responsibilities. The CGIAR should carry out an analysis to determine options for decisionmaking in this area of activity. In the meantime, contacts with scientific establishments in that part of the world should be encouraged.

In Memoriam



The 1995 CGIAR Mid-Term Meeting paid homage to the memory of three valued members of the extended CGIAR family: Lewis T. Preston, Larry Stifel, and Martin Bicamumpaka.

Referring to the contributions made by Messrs. Preston, Stifel, and Bicamumpaka to the work of the CGIAR, CGIAR Chairman Ismail Serageldin said, "Each represented a different area of activity from the others. Their efforts epitomized the scope and breadth of the CGIAR."

Lewis T. Preston, President of the World Bank, was an ardent believer in the mission of the CGIAR. He was unreserved in his encouragement of the renewal process that the CGIAR launched at its Mid-Term Meeting in New Delhi, India in May 1994, and unstinting in his support for stabilizing its finances. He was personally and enthusiastically involved in convening the Ministerial-Level Meeting held in Lucerne, Switzerland in February 1995. Ill health prevented his attendance.

In his very last communication to the CGIAR Chairman, he congratulated the CGIAR on achieving in Lucerne a "success that exceeded all expectations." He was confident, he wrote, that as a result "the poor of the world will be better off." Even in the throes of terminal illness, he remained a compassionate and deeply concerned person.

Larry Stifel, a well-liked and respected colleague and a former Director General of both IITA and ICLARM, served the CGIAR in several capacities over many years. He always brought to his tasks a high level of scientific and managerial competence, a sense of mission, and a profound commitment to improving the lives of people.

During the Mid-Term Meeting, the CGIAR learned of the tragic death in Rwanda of Martin Bicamumpaka, who coordinated the network that links potato and sweet potato research in seven countries of Eastern and Central Africa. He was arrested in February, when he was due to attend a "Seeds of Hope" meeting. Despite strenuous exertions on his behalf by many, he remained in jail without trial, and died three days after he was taken to the hospital in very serious condition.

Subsequent to the 1995 Mid-Term Meeting, the CGIAR learned of the loss of CGIAR stalwart William Mashler. He was an inspiration to the CGIAR, helping in its creation and participating in its growth. His commitment to international development was driven by a profound concern for the needs of the world's disadvantaged. At all times, he demonstrated a rare blend of intellect and compassion. He was known, as well, for a refreshing forthrightness matched by an abundant wit. The lives he touched were enriched by the experience. Condolences on behalf of the CGIAR were sent to his family.

Renewal of the CGIAR— The Year in Review



WARDA

Progress in meeting the goals of the eighteen-month program of renewal launched at the 1994 CGIAR Mid-Term Meeting, held on May 23-27 in New Delhi, India, is the primary focus of this Annual Report. Its closing point is the 1995 Mid-Term Meeting, held on May 22-26 in Nairobi, Kenya, at which the CGIAR moved from decisions to actions.

The purpose of the renewal program is to clarify the vision of the CGIAR, refocus its research agenda, reform its governance and operations, and secure renewed support for its international mission. Underpinning the program of renewal is a commitment to ensuring that the CGIAR fully represents a South-North partnership at all levels of activity.

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THE ROAD TO LUCERNE

The diminution of funding in 1992-1993 that sparked a crisis in the CGIAR was reversed through a short-term stabilization program launched in New Delhi. Central to the stabilization program was a World Bank package of emergency assistance, which included a one-time grant of up to \$20 million to match additional contributions from other donors at a ratio of 1:2. Additional contributions were provided by other CGIAR members in the form of new funds (\$12.6 million) and funds reprogrammed from activitics outside of the agreed research agenda (\$7.5 million), triggering disbursement of the World Bank's special contribution. These additional funds raised total 1994 contributions to \$265 million to fully finance the 1994 work program. The prospects are equally positive for 1995, with full funding anticipated.

With the short-term problems resolved, the CGIAR was able to concentrate, at International Centers Week 1994 on October 24-28, on its preparations for the key event in the period under review: a Ministerial-Level Meeting held in Lucerne, Switzerland on February 9-10, 1995. The meeting was convened by FAO, UNDP, and the World



CIF

Bank, as cosponsors of the CGIAR, and was hosted by the Government of Switzerland.

Preparations for the Lucerne meeting included refinement of the mechanisms adopted in New Delhi-such as a matrix approach to funding and a shift to a program-based research agenda-as well as the development of new strategies for governance and finance. Ideas concerning all aspects of the CGIAR were reviewed in September by the CGIAR's Steering Committee, Oversight Committee, Finance Committee, and a specially convened Stakeholder Panel, and were embodied in a set of five documents on vision, the research agenda, proposals for improving governance, and new financing arrangements, together with an overview encapsulating the substance of the five, submitted for review at the Lucerne meeting.

COMMITMENT AND GUIDELINES

"Renewal of the CGIAR: Sustainable Agriculture for Food Security in Developing Countries" was the theme of the Ministerial-Level Meeting, a milestone along the path to renewal as well as in the 24 year life of the CGIAR. It was the highest level event connected with the CGIAR since a Bellagio Conference led to the establishment of the CGIAR on May 19, 1971.

The nine founders who established the CGIAR were convinced that science and technology should be on the front lines in the battle against hunger and poverty. Their faith was well founded. The major challenge faced by the CGIAR at its creation—increasing productivity in the face of a fast-approaching threat of famine in post-colonial societies—has been confronted.

The legacy of Bellagio sustained the CGIAR for almost 25 years, and enabled it to make substantial contributions to food production and food security in developing countries, most notably through the green revolution.

Facing a range of new challenges, the CGIAR turned to the international community once again in Lucerne, seeking both renewed commitment and a set of guiding principles. Consequently, discussions in Lucerne followed an agenda designed to meet two objectives:

- to identify the nature and extent of the most pressing challenges confronting the international development community; and
- to determine how best the capacities of the CGIAR should be deployed to assist the international community in overcoming these challenges.

Thirty-nine delegations attended the Lucerne meetingeighteen from industrialized countries, eight from developing countries, and thirteen from foundations and international and regional organizations. Delegations from the South included new members that joined the CGIAR since the reform program was launched-Colombia, Côte d'Ivoire, Egypt, Iran, and Kenya—as well as established members—India, Indonesia, and The Philippines. Fourteen delegations were repre-

Preserving the Earth's Heritage

Tn October 1994, the genetic resources collec-Ltions of the CGIAR Centers were placed under the auspices of the FAO Commission on Plant Genetic Resources, under agreements signed at International Centers Week by CGIAR Chairman Ismail Serageldin and FAO Representative Mohamed Zehni. The CGIAR was the first organization to make this arrangement.

A draft text of the proposed agreements was reviewed in May 1994 at the Mid-Term Meeting in New Delhi, India. CGIAR members felt that some clarifications were required before the agreements were signed. These were sought and obtained.

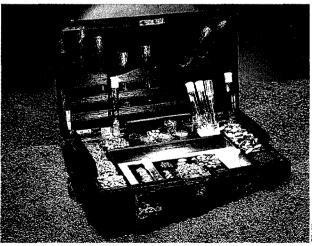
In brief remarks at the signing ceremony, Mr. Serageldin highlighted the landmark character of the event. In addition to significantly advancing international cooperation in the conservation and use of plant genetic material, the CGIAR, by taking a unified approach, was truly acting as a System, speaking with a single voice. He added that conserving the world's genetic resources of food crops was critical for the very survival of humankind, and required a coordinated international effort.

Mr. Zehni described the agreements as an important step toward realizing the FAO Global System on Plant Genetic Resources and in implementing inter-governmental initiatives. Signing the agreements, he added, opened the way to continuing progress in a dynamic process of consultation and cooperation.

In connected developments at International Centers Week 1994, the CGIAR:

- decided that the CGIAR Chairman should be the System's ambassador in relations and negotiations with other institutions on issues regarding genetic resources;
- established a Genetic Resources Policy Committee under the chairmanship of M. S. Swaminathan to assist the Chairman in his leadership role and to advise the CGIAR on policy matters;
- elevated Center genetic resources units to the level of a systemwide program; and
- requested the Inter-Center Working Group on Genetic Resources to act as a steering committee for the systemwide program, with IPGRI as lead Center.

Issues connected with the conservation and use of genetic resources were further reviewed at the 1995 Mid-Term Meeting in Nairobi, Kenya, when it was decided that the CGIAR should be represented at the next meeting of the Conference of the Parties of the Convention on Biological Diversity, to be held in November 1995.



sented by ministers and heads of agencies, fifteen by deputy ministers and deputy heads of agencies, and ten by other representatives. Collectively, the delegations provided the renewed support and counsel that will enable the CGIAR to respond effectively to complex development challenges and changing international circumstances.

THE LUCERNE DECISIONS

The Lucerne meeting:

- made a firm commitment to addressing the challenges of promoting a people centered sustainable development that helps feed the hungry, reduces poverty, and protects the environment:
- placed agriculture at the heart of the development paradigm, reaffirming that agriculture is both a catalyst and an integral component of development;
- identified agricultural research as a fundamental precondition of sustainable agricultural development;
- recognized the CGIAR, with its proven research capacity and its effective approaches to developing sustainable agriculture, as a valuable and vital contributor to international development efforts:
- endorsed the current emphasis of the CGIAR on



natural resources management, twinned to its continuing goal of increased food productivity;

- invited UNEP to join the group of cosponsors;
- enjoined the CGIAR to continue its efforts to nurture a dynamic South-North partnership, working in the interests of the world's poor and marginalized:
- adopted a Declaration and Action Program which defined the mission of the CGIAR as to contribute, through its research, to promoting sustainable agriculture for food security in the developing countries, and set down guidelines for action in four areas: broader partnerships, the research

- agenda, governance, and finance: and
- encouraged the CGIAR to complete its reform and renewal process within the eighteen-month time frame.

The Spirit of Lucerne provided the CGIAR with the momentum and impetus to move forward vigorously as a rededicated South-North enterprise, capable of fulfilling a global vision of less poverty in the world; a healthier, better nourished, human family: reduced pressure on fragile natural resources; and people-centered policies for sustainable agricultural development.

FROM DECISIONS TO ACTIONS

The program of renewal continued in Nairobi, Kenya

The Establishment of ILRI

n international agreement creating ILRI as the new CGIAR livestock research center. was signed in Bern, Switzerland on September 21, 1994. ILRI was actively at work in early 1995.

The decision to establish a single CGIAR livestock research center with global responsibility for strategic research in genetics, physiology, nutrition, and health was based on recommendations from a Working Group led by John "Taff" Davies (United Kingdom) as well as from TAC. The Rockefeller Foundation served as the implementing agency for the decision.

A single, livestock research strategy was expected to incorporate appropriate programs from the existing livestock research centers, the International Livestock Centre for Africa (ILCA) and the International Laboratory for Research on Animal Diseases (ILRAD), and from other Centers, including CIAT, ICARDA, ICRAF, ICRISAT, IFPRI, and ISNAR.

A Steering Committee, chaired by Lucia de Vaccaro and appointed by the CGIAR to develop a unified strategy and program for livestock research, highlighted the following guidelines:

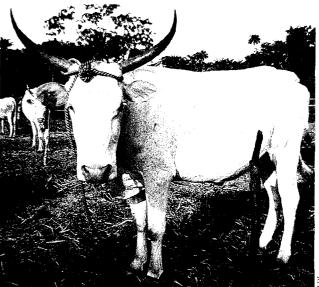
- Animals should be viewed as a component of an integrated production system.
- Ruminants should be given priority in mixed production systems because of their

importance as primary products, in soil recuperation, and in other aspects important to both the cropping system and the household.

Diversity of livestock production systems should be reflected in ILRI's participation in the ecoregional initiatives of the CGIAR. and by its agenda for strategic research in terms of the problems identified at ecoregional sites.

ILRI's headquarters are located in Nairobi, Kenya and research campuses are being maintained both at the headquarters site and in Addis Ababa, Ethiopia. ILRI's first Director General is Hank Fitzhugh and the first Chair of its Board of Trustees is Neville Clarke.

One of the first tasks undertaken by the Board was the preparation of a Strategic Plan. the 1994-1998 Medium-Term Plan, and the 1995 Program and Budget.





ICRISAT

in May 1995, when a series of actions were decided on to implement the Lucerne decisions. Actions will be taken in the areas that were the focus of the *Lucerne Declaration* and Action Program, as indicated in the summary that follows:

Broader Partnerships

 The CGIAR reaffirmed its commitment to broaden membership by including more members from the South, and to incorporate the perspective of NARS that convened for consultations organized by IFAD in Rome prior to the Lucerne meeting and in Nairobi at the time of the Mid-Term Meeting. The Nairobi consultation set up a working group on NARS-CGIAR linkages whose recommendations will be submitted to International Centers Week 1995.

The CGIAR welcomed the steps taken by the Chairman to seek the views of NGOs and the private sector on the establishment of a private sector committee and a NGO committee to institutionalize the dialogue between the CGIAR and

others with compatible interests. The committees are to be established before International Centers Week 1995. Because of differing interests among groups of NGOs, the CGIAR is expected to take a multi-track approach in its relationship with NGOs.

Research Agenda and Finance

 The Lucerne meeting endorsed a rhythm of decisionmaking which calls for the research program and funding needs of the following year to be taken up at the Mid-Term Meeting of

IITA Wins CGIAR King Baudouin Award

A t International Centers Week 1994, IITA was awarded the biennial CGIAR King Baudouin Award¹ for its pioneering research on breeding hybrid plantains resistant to black sigatoka—a leaf spot disease that is devastating to banana and plantain (*Musa* spp.)—and for advances made in the genetics of *Musa*.

Black sigatoka, generally considered the most serious constraint to *Musa* production in Sub-Saharan Africa, could not previously be countered by research because the crop was unresponsive to classical breeding methods. A breakthrough in *Musa* breeding technology, achieved by IITA using techniques involving basic, strategic, and applied research, led to the development of hybrid plantains resistant to black sigatoka. In the process, more insight was gained into *Musa* genetics, resulting in the emergence of new breeding strategies for the improvement of bananas and plantains.

IITA collaborated in its research with twelve national agricultural research systems in Sub-Saharan Africa and Latin America as well as with the International Network for the Improvement of Banana and Plantain (INIBAP) and a number of advanced laboratories in Belgium and the United States.

Following the presentation of the award by CGIAR Chairman Ismail Serageldin and its acceptance by IITA Director General Lukas Brader, the Belgian Ambassador to the United States, His Excellency André Adam, addressed the CGIAR. He reaffirmed the strong interest of the Belgian Royal Family in the research activities of the CGIAR. Congratulating IITA, he said that research on banana and plantain was one of the priority areas identified for special support by Belgium.

When the CGIAR was awarded the King Baudouin International Development Prize by Belgium in 1980, it decided to invest the prize money and use the income for a biennial award in recognition of outstanding work done by one or more of the Centers. TAC serves as the selection committee for the CGIAR's King Baudouin Award. Previous winners of the award were IRRI in 1982, CIAT in 1984, IITA in 1986, CIMMYT in 1988, CIAT and IITA in 1990, and CIP in 1992.



Free at Last

Thomas R. Hargrove, Editor and Head of the Communications Unit at CIAT, was kidnapped in Colombia on September 23, 1994, while in service to the CGIAR and, through the CGIAR, to the poor in developing countries around the world. After 334 days in captivity, he was released on August 22, 1994. Welcome home, Tom!

the current year (e.g. in May 1995 for 1996). This provides time for negotiations and discussions between donors and the CGIAR Secretariat in the May to October period, leading to the establishment of a financing plan at International Centers Week for a fully funded research agenda.

As background to the 1996 research agenda, the CGIAR reviewed reports from special groups set up to advise members on genetic resources, sustainable agriculture, and the ecoregional approach to research; and heard presentations from TAC Chair Donald Winkelmann on the research agenda for 1996 and from Finance Committee Chair Michel Petit on the funding of the research agenda. The 1996 research agenda was adopted, and an indicative funding figure of \$299 million to implement the agreed agenda was endorsed as realistic and achievable. [See page 75 for a report on the 1996 research agenda by the TAC Chair.l

Governance

- The CGIAR discussed the requirement of the *Lucerne Action Program* that it should strengthen the assessment of its performance and impact by establishing an independent evaluation function reporting to the CGIAR as a whole, and decided to establish an Impact Assessment and Evaluation Group, as well as a "sounding board" of stakeholders to assist the new group.
- Both units will take account of the work done by CGIAR Centers to harmonize data generation, methodologies, and analysis.

LOOKING AHEAD

The importance of the actions taken in Nairobi in terms of the renewal program were summed up by CGIAR Chairman Ismail Serageldin as follows:

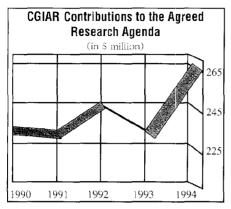
"I have been very gratified to see the spirit which everyone has brought to these proceedings, and their commitment not just to a System, but in fact to an idea—an idea that through agricultural research we can do much better for the world and especially for the disadvantaged.

Someone told me earlier that they noticed the emergence of a common vocabulary, that people were genuinely concerned about the environment, about poverty, about the disadvantaged, and about food security, and that all of this permeated the discussions in a way that was natural and unforced. That is most encouraging because that is what we are here for.

We are here to make the work of Center scientists possible because we share the same dedication to the ultimate objectives for which they are working, which is the welfare of the poor and future generations.

Sustained by the Spirit of Lucerne and now reaffirmed by the Spirit of Nairobi, we can go forward, striving to ensure that the hungry are fed and the poor sustained. That much we owe to our own generation, but we owe even more to generations yet to come."

1994 Financial Report Highlights



A financial report, providing a comprehensive systemwide report on the CGIAR's annual financial flows, is issued by the CGIAR Secretariat each year. The results are reported in U.S. dollars. Centers issue other documents, including audited financial statements, annu-

al reports, and project reports, to describe and report on their activities and results in detail. The 1994 CGIAR Financial Report was issued in July 1995. What follows are highlights of that report.

FROM CRISIS TO STABILITY

In 1994 the CGIAR faced a financial crisis resulting from the substantial gap in funding between the requirements of its agreed research agenda, at \$270 million, and actual funding estimated for 1994, at \$219 million. At International Centers Week in October 1993, the CGIAR approved a curtailed research agenda to remain within available funding. Since projected 1994 funding was 6 percent below the 1993 level, in real terms the curtailed agenda forced a 10 percent reduction in 1994 spending. As spending had already been cut back by 6 percent in 1993, this further reduction in 1994 led to a financial crisis.

In response to the crisis, the CGIAR launched, at its Mid-Term Meeting in May 1994, a financial stabilization program for 1994 and 1995 as part of a broader eighteen-month effort to revitalize the CGIAR. The renewal program called for the adoption of the agreed agenda for 1994 to 1998 and a financing target of \$270 million. The cornerstone of the stabilization effort was the World Bank's offer to match, at a 50 percent rate and up to \$20 million, additional support for the agreed agenda from CGIAR members. For planning purposes, this was equally divided between 1994 and 1995.

CGIAR members responded positively, and support for the agreed agenda in 1994 totaled \$268 million, virtually meeting the \$270 million target. This was accomplished by members providing additional funds, by redirecting existing complementary funding in support of the agreed agenda through changes made in the content

of the programs, and by relabelling complementary funding that was actually supporting the agreed agenda. Of the \$49 million in incremental funds, \$20 million represented new and redirected contributions, matched by the World Bank's \$10 million, and \$19 million represented relabelled complementary funding.

OVERALL FINANCIAL OUTCOME

The CGIAR Centers are independent organizations governed by policies established by their Boards of Trustees. In the interest of transparency and consistency in financial practices and the presentation of financial information, the Centers follow common financial guidelines. These guidelines aim to bring CGIAR financial practices into conformity with those generally accepted for not-for-profit organizations. Guidelines covering accounting policy and the preparation of externally audited annual financial statements are particularly relevant in this regard.

Table 1 [see next page] provides highlights of the CGIAR's overall financial outcome in 1994. Total resources available for CGIAR activities in 1994 were \$337 million, 6 percent above the 1993 level. This included \$268 million in grants for the agreed agenda, \$57 million in complementary grants, and \$12 million in miscellaneous

Center income. Support for the agreed agenda amounted to 0.46 percent of Official Development Assistance (ODA) in 1994, an improvement over the 1993 level of 0.42 percent. Countries that expanded their ODA in 1994, notably Australia, Denmark, Japan, Norway, and Switzerland, also provided increased levels of support to the CGIAR.

Expenditure on the 1994 agreed agenda was \$265 million. an increase of 4 percent from the 1993 level of \$254 million. The restoration and expansion of funding reversed the 1993 deficit of \$5.1 million to an operating surplus of \$15.1 million. The surplus led to an increase in the aggregate operating fund balance (i.e., retained earnings) of the CGIAR Centers to about \$52 million, equivalent to expenditure requirements for about two months. The fund for capital renewal increased by \$12 million to \$46 million, representing approximately 10 percent of the CGIAR's fixed asset base.

CGIAR GRANTS

The CGIAR is financed by grants from an informal consortium of industrial countries, developing countries, private foundations, and international and regional organizations. Industrial countries—specifically the members of the Development Assistance Committee of the Organization for Economic Cooperation and Development (OECD)—account for more than two-thirds of CGIAR financing.

Grants from members in 1994 totaled \$325 million, of which \$268 million were for the agreed agenda and \$57 million for complementary programs. Total grants increased by 5 percent or \$14 million, compared with 1993. Grants for the agreed agenda rose by \$33 million, or 14 percent relative to the 1993 level of \$235 million. As shown in Chart 1 [see page 29], this increase resulted from higher contributions from most member groups, with the exception of industrial countries in North America, namely the United States and Canada.

Of the \$268 million in grants supporting the 1994 agreed agenda, approximately \$205 million, or 76 percent, were unrestricted and \$64 million, or 24 percent, were restricted. This distribution is a departure from past years, when unrestricted grants averaged about 82 percent and restricted grants about 18 percent. The 1994 distribution reflects the restricted nature of most of the additional support engendered by the stabilization program. Every Center had restrictions on a certain percentage of its agreed agenda support in 1994.

Funding of complementary activities in 1994 amounted to \$57 million, 26 percent lower than the 1993 level of \$76 million. This reversed the trend in recent years of expansion in complementary funding in both absolute terms and as a share of total funding. As a result of the stabilization program, about \$28

Table 1. CGIAR Financial Highlights, 1990-1994 (in 8 million)

	19	90	19	1991		92	19	93	1994	
A. Resource Summary (5)	Research Agenda	Total	Research Agenda	Total	Research Agenda	Total	Research Agenda	Total	Research Agenda	Total
_										
Grants	224.0	207.0	221.0	201.	247.2	240.7	224.7	244.2	202.1	225.0
CGIAR contributions	234.9	287.9 6%	231.9	291.1	247.3 7%	318.7 9%	234.7	311.3	268.1 14%	325.2
Annual change (%) Other Revenue	170	22.0	-1 78 1	18.5		16.1	-:178	6.9	14.76	4% 11.7
Total Revenue	1	309.9		309.6		334.8		318.2	<u> </u>	336.9
System Expenditure										
Operations	231.9	280.7	248.4	295.1	258.7	318.5	254.1	321.4	264.7	321.8
Capital	17.6	26.6		11.1		7.4		1.9		0.0
Total Expenditure	249.5	307.3	248.4	306.2	258.7	325.9	254.1	323.3	264.7	321.8
			1							
Net Surplus/(Deficit)	 	2.6		3,4		8.9		(5.1)	·	15.1
No. 2 0/ 24 2002		0.8%		1 10/		1 Tov		-1.6%		4 50
Net, as % of revenue	1	0.8%		1.1%		2.7%		-3.6%		4.5%
Agenda funding, % of total	82%		80%		78%		75%		82%	
% CGIAR funds unrestricted	83%	68%	84%	69%	82%	63%	83%	63%	76%	63%
# contributing CGIAR donors	33		39		36		38		40	
CGIAR grants as % ODA	.44%	.54%	.41%	.51%	.41%	.52%	.42%	.55%	.46%	.56%
B. Expenditure Share Profile (%)										
	i i		ļ						i	
Program (operations)			1							
Research programs	46%		46%		49%		48%		56%	
Research support	10%		- 10%		10%		9%		8%	
Training/communications	18%		18% 27%		16%		15%		12%	
Research management	26%		2770		2 / 70		28%	Í	25%	
Region (operations)										
Sub-Saharan Africa	42%	Land of the	43%		39%		37%		39%	
Asia	30%		29%	111	33%		34%		32%	
Latin America and the Caribbean	16%		15%		16%		15%		18%	
West Asia and North Africa	13%		13%		12%		13%		11%	
			ï				į			
Object									1	
Personnel	54%		58%		57%	1	59%		56%	
Supplies/Services	32%		28%	1	30%		28%		31%	
Travel	7%		6%		6% 7%		6%		6%	
Depreciation	1 70		8%		/ 70		7%		7 %	
C. CGIAR Staff (#)							Ī		-	
C. COMMONITOR	1						į			
International staff	757	912	760	882	808	973	801	957	801	888
Support staff		10,749		10,915		11,041		9,981		9,843
Total staff		11,661	l E	11,797		12,014		10,938		10,731
	1				1		}		1	
D. CGIAR Financial Indicators					i		ĺ		l i	
- · · · · · · · · · · · · · · · · · · ·		404.0		405.0		424.6		435.8	1	474.7
Total assets (\$)	+	401.0 215.2	r	405.9 214.5	+	434.6 215.7	<u> </u>	220.8	+	471.7 220.8
Fixed assets (\$) Operating and other funds (\$)	F	52.7	1:	46.1	-	46.9	ŀ	42.9	-	51.7
Capital fund (\$)	-	4.7		11.8	-	25.6	ľ	34.1	i-m	45.9
Current ratio		1.6	<u> </u>	1.6		1.6	į	1.7	ļ	1.7
	t		T				Ì			
Memo notes:										0
Centers' cost deflator (1994 = 1.00)		0.91	Ĺ	0.95		0.97	-	0.96		1.00
1994 estimated total ODA, in \$ billion		53.0	į.	56.7	Ĺ	60.8		56.4		57.8
Number of Centers		13		13		18		18		16

million in complementary funds were reallocated in support of the agreed research agenda. If there had not been a stabilization program, the 1994 complementary funding would have amounted to \$85 million, an 11

percent increase over the 1993 level. Chart 2 illustrates the evolution of CGIAR grant funding from 1990 to 1994. It confirms that the recent trend toward relatively higher complementary support was reversed in 1994.

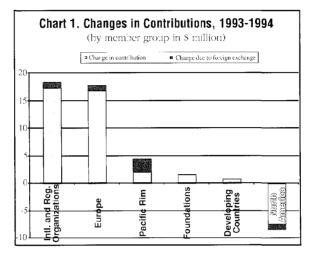
CONTRIBUTION PROFILE

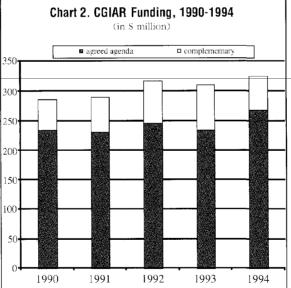
In 1994, thirty-nine members contributed to the CGIAR's agreed agenda, compared with 38 members in 1993. Russia and Colombia joined the CGIAR in 1994, each supporting one Center. The average contribution per member increased from \$6.2 million to \$6.5 million, with the average contribution of the 38 members that contributed in 1993 increasing to \$7 million in 1994. The top 10 CGIAR members provided a slightly lower share of total support, at 78 percent, to the agreed agenda then in 1993, when their share was 80

For analytical purposes, the thirty-nine contributing members in 1994 can be placed in four distinct groups: industrial countries (20), developing

percent.

countries (6), foundations (2), and international and regional organizations (11). The industrial countries can be further subdivided along geographical lines into three groups: Europe, North America, and the Pacific





Rim. It should be emphasized that, as contributions to the CGIAR are voluntary and each CGIAR member has the freedom to decide which Centers to support and at what level, the trends emerging from any of the groupings should not be

interpreted as policy decisions by a grouping as a whole. Chart 3 [see next page] reflects the composition of funding for the agreed agenda in percentage terms by groupings of members.

> The highest increase in contribution in 1994 was made by the International and Regional Organizations grouping, led by the World Bank's extraordinary contribution of \$10 million. The Inter-American Development Bank and the Arab Fund for Economic and Social Development also made special contributions in support of the stabilization program. Other volume increases within this grouping resulted from a reallocation of complementary funds.

Contributions from European members increased by more than \$17 million, or 26 percent, from 1993. Almost half of this increase was in the form of new funds for systemwide and ecoregional initiatives. Three members in this group—Denmark, Sweden, and Switzerland—provided

an additional \$7 million in support of the agreed agenda in 1994. The remaining increase represented reallocated complementary funds.

Contributions from Pacific Rim industrial countries— Australia and Japan—also rose by \$4 million, or 12 percent, in 1994. Contributions from Foundations and from the Developing Countries grouping increased sharply, by 26 percent and 33

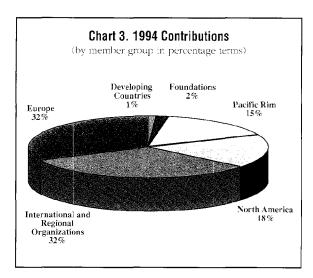
percent, respectively. Contributions by Developing Countries increased as a result of the entry of Colombia into the CGIAR, with an initial contribution of \$1.2 million, and a 50 percent increase in India's contribution.

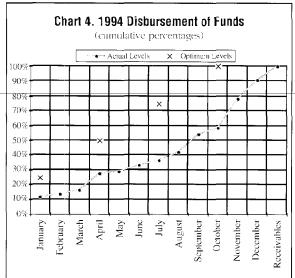
The largest reduction in contribution in 1994 was by the North American grouping, at \$7.7 million. Unrestricted support from the United States declined by more than one-quarter, or \$10 million. The World Bank and the United States showed the highest increase and decrease, respectively, by a single member from 1993 to 1994.

Only about 10 percent of the increase of \$33 million resulted from favorable exchange rates on non-dollar disbursements. The bulk of the increase resulted from exchange gains as the Japanese yen

strengthened against the U.S. dollar. Exchange gains were also experienced to a lesser extent on European currencies, including the European Currency Unit (ECU), and were responsible for the exchange gains by the International and Regional Organizations grouping, as well as by European

members. The only major currency showing weakness against the U.S. dollar was the Canadian dollar, which resulted in a \$1 million exchange loss.





Regarding complementary support, funding from the North American and European members declined from 59 percent in 1993 to 54 percent in 1994; however, they maintained their positions as the most important complementary member groupings, with 22 percent and 32

percent of the total, respectively. The broadening of the complementary funding base that took place in 1993 continued in 1994: the five largest members

provided only 45 percent of the total, a decline in share from 1993, when the top five provided 51 percent.

DISBURSEMENT OF FUNDS

As in 1993, disbursement of funds by members in 1994 lagged behind the minimum levels required to cover the next quarter's expenses, as shown in Chart 4. By mid-year, only about onethird of the funds had been disbursed to the Centers. Had the World Bank not disbursed \$37 million in the first half of 1994, most Centers would have faced severe cash flow problems until the latter half of the year. These disbursement lags require Centers to maintain financial reserves.

WORLD BANK SUPPORT

World Bank support has traditionally been provided exclusively to reduce gaps in approved Center budgets. In 1994 World Bank support was applied for dual purposes: the first tranche, or 50 percent of the contribution, was used to support Centers on the basis of the approved program; the other 50

percent was used to narrow gaps remaining in the approved budgets after all other funding was taken into account. In 1994, the gap-filling limit on World Bank funds of 25 percent of a Center's approved budget was waived, and four Centers received 25 percent or more of their support from the Bank that year.

RESOURCE ALLOCATION

by object of expenditure.

The allocation of resources in 1994 can be viewed from four perspectives: by CGIAR activity, by cost center, by region, and

By CGIAR Activity

Chart 5 illustrates 1994 allocations in terms of the five CGIAR activity clusters: increasing productivity (germplasm enhancement and breeding, and production systems development and management); protecting the environment; saving biodiversity; improving policies; and strengthening NARS in developing countries.

There were some notable changes in allocations to the activity clusters in 1994, as well as a continuation of several past trends. Investment in protecting the environment and in saving biodiversity increased significantly. Investment in germplasm enhancement and breeding declined modestly as a percentage of resources available from members (though dollar values

increased, reflecting the positive pattern of support for the CGIAR in 1994 generally). Policy work remained at about the level of previous years. Investment in production systems development and management declined as a share of total support. Investment in strengthening NARS continued to decline, with the total program experiencing a drop of 15 percent from the 1993 level in terms of share of total investment. This decline was fairly evenly spread across various subactivities.

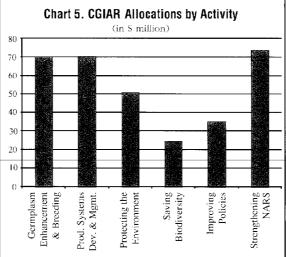


Table 2 [see next page] shows the allocation of member funding to different programs and activities, as well as CGIAR investments in both dollar and percentage terms.

By Cost Category

In 1994, allocations increased significantly for research programs encompassed by the agreed agenda. The change

over the 1993 level was nearly 17 percent for the agreed agenda and 20 percent overall. This reflects Center efforts to reduce administrative costs. Overhead costs, both administrative and research-related, were down in 1994.

By Region

Activity increased in both dollar and percentage terms in Sub-Saharan Africa and in Latin America and the Caribbean, a reversal of 1993, when alloca-

> tions for Sub-Saharan Africa declined in percentage terms compared with 1992. The increased activity in Sub-Saharan Africa was the result of two factors: a change in the focus of ongoing activity (i.e., comparable on a year-toyear basis), and a decline in the African complementary program, which in part reflects the redirection in 1994 of some complementary activity to the research agenda. In the case of Latin America and

the Caribbean, activity increased in both the research agenda and the complementary program. In Asia and West Asia and North Africa investment decreased. Activity in Asia declined in both the research agenda and the complementary program. In West Asia and North Africa, expenditure on the research agenda declined in percentage terms as a share of expenditure. Chart 6 [see next page] shows CGIAR expenditure by region in 1994.

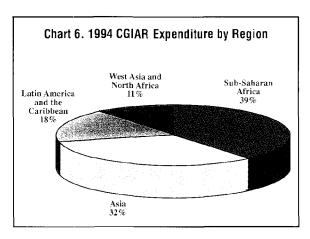
By Object of Expenditure

In 1994, personnel costs decreased in absolute and in percentage terms in both the research agenda and complementary program, consistent with downsizing actions begun in 1993. The contraction of expenditures on personnel is a significant development; it indi-

cates that in 1994 the normal increases associated with unit personnel costs were more than offset by the reduction in the size of the payroll.

STAFFING PATTERNS

1994 saw a significant change in the composition of personnel. Internationally recruited-staff declined by 7 percent overall. Of this, the number of people employed for the research agenda remained at 801, while the number employed for the complementary program decreased by nearly 50 percent, to 87. Staff engaged on local or national contracts also decreased by about 200 or 2 percent.



With the increase in research agenda activity, it might be expected that the number of internationally-recruited staff should increase, because expenditure, a good reflection of activity, rose by \$8 million. That it did not reflects the fact that Center staff downsizing programs are having an effect. On the basis of a gross expen-

diture/internationally-recruited staff ratio, the S8 million spending increase might have been expected to result in an additional 20 or so internationally-recruited staff in the CGIAR System.

INFLATION

The costs at CGIAR Centers are affected by

Table 2. Funding for CGIAR Research and Research-Related Activities, 1992-1994

(in 8 million and percentage)

		1992				1.1	1993				1994			
		Res. A	Agenda	enda Total		Res. Agenda		Total		Res. Agenda		Total		
	Activity	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	
1	Germplasm Enhancement and Breeding	58.6	24%	69.9	22%	55.2	24%	67.4	22%	62.7	23%	70.5	22%	
	Production Systems Develop, and Mgmt.			4										
2	Crops and Cropping Systems	38.2	15%	49.8	16%	34.6	15%	47.1	15%	42.2	16%	49.7	15%	
3	Livestock and Livestock Systems	20.2	8%	20.4	6%	18.7	8%	18.9	6%	15.9	6%	16.4	5%	
4	Trees and Tree Systems	3.8	2%	4.4	1%	4.6	2%	5.2	2%	4.0	1%	5.0	2%	
5	Fish and Aquatic Systems	1.1	0.44%	1.9	0.60%	1.0	0.41%	1.9	0.59%	1.2	0.45%	1.6	0.49%	
6	Protecting the Environment	28.4	11%	36.9	12%	33.1	14%	42.2	14%	40.6	15%	51.3	16%	
7	Saving Biodiversity	19.0	8%	21.7	7%	13.6	6%	16.4	5%	22.9	9%	25.6	8%	
8	Improving Policies	24.4	10%_	32.4	10%	22.9	10%	31.5	10%	26.3	10%	34.5	111%_	
	Strengthening NARS						. 1							
9	Training	21.4	9%_	30.6	10%	18.0	8%	27.9	9%	17.7	7%	22.6	7%	
10	Doc./Public./Info. Dissemination	19.1	8%_	21.8	7%	20.6	9%	23.6	8%	19.4	7%	20.6	6%	
11	Organization/Management Counselling	5.6	2%_	16.3	5%	6.9	3%	18.4	6%	7.0	3%	14.5	4%	
12	Networks	7.6	3%	12.6	4%	5.6	2%	11.0	4%	8.2	3%	12.9	4%	
	TOTAL	247.3	100%	318.7	100%	234.7	100%	311.3	100%	268.8	100%	325.2	100%	

both inflation and fluctuations in currency values—the relationship between the exchange rates of expenditure currencies and the U.S. dollar, the unit of account in the CGIAR. An aggregate CGIAR cost increase index in dollar terms can be established using data on the proportion of expenditures in various currencies and the annual exchange rates of currencies reported by the International Monetary Fund. For 1994, the loss in purchasing power in the CGIAR due to cost increases was 5 percent.

1994 FINANCIAL POSITION

A complement to the previous discussion of CGIAR revenue and expenditure is an analysis of the System's financial position. The 1994 financial information confirms a number of positive trends, and indicates that the CGIAR System, and the Centers individually, are in good financial condition.

For 1994, liquidity, as measured by cash, working capital,

current ratio, and cash/cash equivalents, increased. This reflects good cash management practices, as well as growing CGIAR operating and capital fund balances. The net book value of fixed assets remained largely unchanged in recent years. This implies a stable and predictable purchase of capital assets, both replacement and new acquisitions. Expansion of physical facilities was modest overall.

In the CGIAR, loans are generally limited to short-term credit to cover delays in member payments. Hence, long-term liabilities in 1994 remained very low. The mechanism of capital fund accumulation, through funding depreciation, appeared to work as planned. The operating fund (i.e., retained earnings) showed an increase in 1994. This was due in part to the overall operating surplus and to the reclassification of a number of miscellaneous small funds into the operating fund. The operating fund balance had dipped in 1993, and returned to historical levels, in real terms, in 1994.

The CGIAR's systemwide current ratio rose to almost 1.75 in 1994, indicating a healthy, and improving, relationship between current assets and current liabilities. The current ratio is commonly used to measure liquidity, and many enterprises aim to maintain a ratio of 1.6 to 2.0.

1995 FINANCIAL PROSPECTS

The momentum of the CGIAR renewal program launched in 1994 is projected to lead to increased funding in 1995 also. At International Centers Week in October 1994 the CGIAR approved a 1995 research agenda requiring financial support at a level of \$271 million, based on an expectation that it would be fully financed. It is now likely that contributions from CGIAR members could, in fact, exceed the approved level by several percentage points, resulting in financial support of up to \$280 million.





with technology population be fed

HEALTH & ENVIRONMENT DE DAILY SATION, JULY 13, 1995

Alternatives to slash-and-burn

agriculture

عشية تبتساب الحذ

Kā أير عام الأبحاث في إيكاردا، عادل البلتاجي:

لية الانتاج الزراعي بالاستعمال الأفضل للأرض

New strategy to fight forest pests

ranks of CGIAR spon

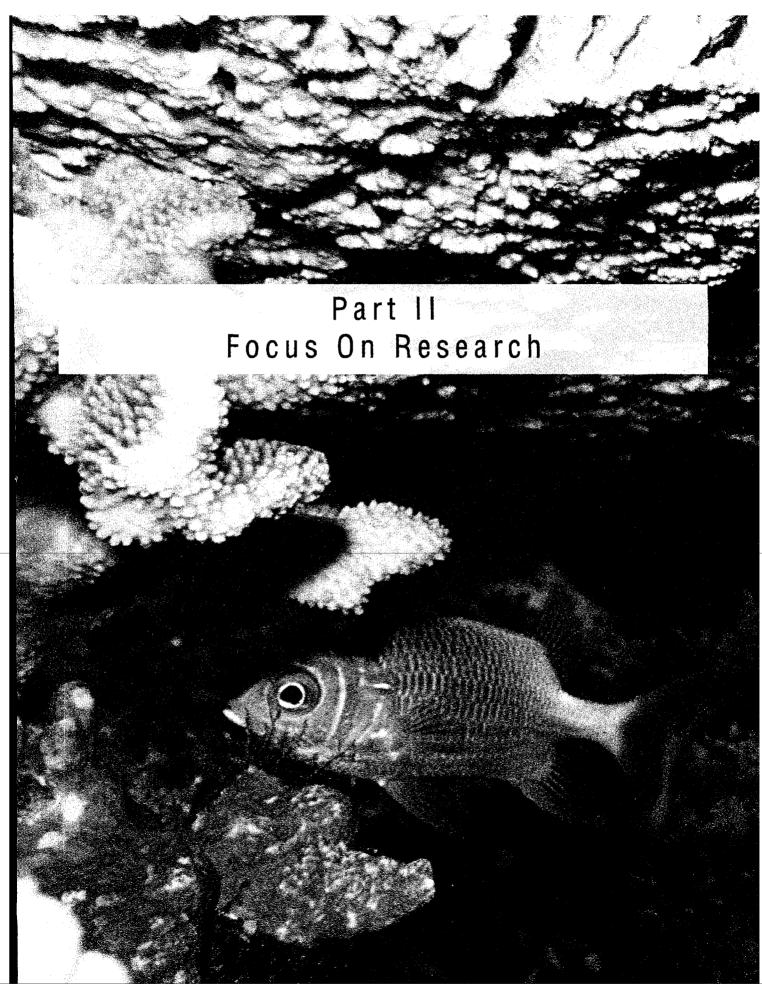
Seed labs help preserve varieties

needed for

More funds ce research









Research is the lifeblood of the CGIAR, and sustainable human development its focus and objective. This part of the Annual Report seeks to capture the scientific excellence that characterizes the CGIAR research endeavor—its breadth, scope, and impact; the partnerships which mark its interactions with counterparts and farmers in developing countries; and its future agenda and focus—in the context of the program of renewal in 1994 and 1995.

The first subsection which follows, *The CGIAR: Research in Action*, builds on a series of audiovisual presentations produced for and screened at the CGIAR Ministerial-Level Meeting in February 1995 in Lucerne, Switzerland. It provides an illustration of the progress and impact of research conducted by CGIAR Centers. The range and scope of research at CGIAR Centers is so extensive that only an illustrative set of examples is recorded here. In addition, Center research highlighted here has been divided into four broad categories, for ease of presentation only.

The second and third subsections are based on presentations made by two distinguished participants in the Lucerne Ministerial-Level Meeting, Nobel laureate Norman Borlaug and Fawzi Al-Sultan. Mr. Borlaug presents an overview of the impact of agricultural research on food production and the future challenges of further increasing agricultural productivity. Mr. Al-Sultan provides insight into the perspectives of the CGIAR's partners in national agricultural research systems in developing countries.

The last subsection focuses on the CGIAR's research agenda in 1996. TAC Chair Donald Winkelmann summarizes the proposed research agenda that was adopted by the CGIAR at its 1995 Mid-Term Meeting in Nairobi, Kenya.

The CGIAR: Research in Action



CONTEXT:
AGRICULTURE AND FOOD NEEDS TO 2025—
WHY WE SHOULD BE CONCERNED

While there is widespread agreement on

projections of population growth, there is no consensus on the world's capacity to meet the expected increases in the demand for food.

World population will increase by 2.5 billion people over the next 30 years, exceeding 8 billion people by 2025. Half of this number will live in cities. Food supplies will need to double to keep pace with increased demand. Urbanization and income growth will cause a shift in diets, from traditional root and tuber crops to cereals, livestock products, and vegetables. There will also be greater demand for foods which store and travel well.

While there is widespread agreement on projections of population growth, there is no consensus on the world's capacity to meet the expected increase in the demand for food. Theories on food supply to 2025 encompass a broad spectrum, from the optimistic to the pessimistic. The optimistic view is that there is no real cause for concern—global food production increases will more than keep pace with increases in demand, and the world will continue to be able to feed itself. At the other extreme is the view that disaster cannot be averted without aggressively addressing the population issue, because the Earth's carrying capacity is already close to being exceeded. A third view, and the one to which poverty activists most often subscribe, proposes that a solution is feasible, but not unless agricultural productivity is increased and natural resources conserved within developing countries themselves. A fourth view relics on developed countries to fill the projected food supply gap, with developing countries producing manufactured goods and trading them for food produced in developed countries.

The conclusions reached by the four scenarios differ markedly, with success or doom determined by the varying rates used to project the world's ability to meet future food demand. These rates include: the



expected growth rate in cereal yield potential; the amount of land added or lost to agricultural production; the amount of land brought under irrigation; and the affect of environmental degradation on food production capacity.

The complacency with which some view the necessary food production targets belies the urgency of the message. All four scenarios assume at least a 2 percent per annum increase in global food production—a level few systems have sustained, particularly without degrading the natural resource base. The expectation that future yields will increase at the same rates as in the past cannot be assumed. CIMMYT and IRRI have found a slowing in the rates of wheat and rice yield increases both under experimental conditions and in farmers' fields. In addition, land that is not presently under production often lies in marginal areas, and urban growth frequently absorbs higher-potential agricultural land. Moreover, irrigated land increasingly competes for water with the needs of urban areas.

All four scenarios recognize the need for sustained research and technology generation to achieve the necessary food production increases. To avoid the doomsday scenario, efforts must now be redoubled in agricultural research at the international. national, and local levels. There can be a 20-year time lag between the initiation of research and the realization of significant increases in farmers' fields—and in 20 years there will be nearly 2 billion more people to feed. Thus, a continuing commitment by the international community to research that promotes sustainable agriculture for food security in developing countries is critical if the food needs of the developing world are to be adequately met in 2025.

COLLABORATION WITH NARS IN DEVELOPING COUNTRIES

Global agricultural research is dependent upon strong national research capacity. CGIAR Centers collaborate with NARS worldwide to further research efforts and to build sci-

entific capacity in developing countries. Such partnerships help to increase food production, conserve genetic resources, promote economic development, and protect the environment in developing countries. As a part of their collaboration with NARS, CGIAR Centers train scientists working at the national level. Since its inception, over 50,000 scientists from developing countries have received training through the CGIAR System.

Building National Capacity

Strengthening NARS. ISNAR has as its specific mandate the strengthening of NARS in developing countries. ISNAR's research and outreach program promotes appropriate agricultural research policies, sustainable research institutions, improved research management in developing countries. ISNAR carries out projects in areas it considers critical for the development of effective NARS, including: improving linkages among research organizations,

technology transfer agencies, and farmers; harnessing more fully human and physical resources for agricultural research aimed at solving the production problems of farmers: improving the policy environment in which national agricultural research operates; providing support to NARS in planning, organizing, and managing research; increasing the access of developing country scientists to information that helps to foster more effective collaboration and enables research to be focused on areas in which the institutions involved have clear comparative advantages; improving the planning, monitoring, and evaluation of research and operations: and helping NARS to integrate, organize, and manage research on natural resources and the environment.

Genetic Resources Programs

IPGRI works in partnership with national institutions in developing countries to build their capacity related to genetic resources. IPGRI's scientific and technical support to national genetic resources programs has contributed to the establishment in over 120 countries of conservation collections of crop germplasm. In India, for example, IPGRI has aided the National Bureau of Plant Genetic Resources (NBPGR) in the establishment of collections of okra, eggplant, and sesame, and has worked with NBPGR in collecting and filling genepool gaps for maize, millet, rice, sorghum, wheat, and other major crops. IPGRI is involved in a wide range of activities, including collection, documentation, training, research, and networking. It has been involved in the collecting of 200,000 samples of crops in 120 countries, and has supported the training of 2,000 scientists and technicians in all aspects of genetic resources work.

Germplasm Development.

Cooperation between national institutions and CGIAR Centers has greatly improved the capacity of germplasm development programs in developing countries. In the past, national programs typically made direct use of germplasm from Centers, releasing new varieties to farmers that were Center lines, tested by national institutions. A general trend for major food crops shows that the use of Center materials by developing countries has progressively evolved. In recent years, many of the varieties released to farmers were bred by national programs themselves, using Center material as parents. For example, in the case of bean germplasm development in Latin America over the past 15 years, most new bean varieties released in the early 1980s were CIAT bred lines. In the mid to late 1980s national breeding programs were still heavily dependent upon CIAT lines, but had introduced varieties based on selections from segregating populations provided by CIAT. In the 1990s, the majority of new lines have been collaboratively bred by national bean programs working with CIAT lines, and a significant number of varieties released were bred using CIAT disease resistant lines as parents. This trend is also evident for maize, rice, and wheat.

New Modes of Collaboration

Founded by 11 West African countries, and currently with 17 members, WARDA is the only CGIAR Center to have evolved from a perceived need of a group of countries. With these origins, it is fitting that in recent years WARDA has been at the forefront of the search for new modes of collaboration

Origins of Bean Varieties Released in Central America

	1978-83	1984-88	1989-93
From Other Countries Thru CIAT Network	28	6	0
CIAT Bred	48	69	6
CIAT/NARS Bred	16	19	61
NARS Bred/CIAT Parents	0	0	33
Other NARS Bred	8	6	0

YA7

between Centers and NARS. Discussions among rice scientists in West Africa, facilitated by WARDA, have resulted in a regional strategy for rice research. Participating countries with strengths in particular aspects of rice research have become regional poles for those aspects, to reduce duplication and better use the limited human and funding resources for rice research in West Africa. Task forces are the modus operandi. Four have been formed for the major rice production environments in West Africa, and eight for key themes. The task forces focus on constraints to rice production and bring together specialists from the region to develop a common action plan.

Reviving Crop Production.

When the Government of Sudan decided in the early 1980s to

revive the country's lentil growing industry because imports were draining foreign exchange, ICARDA cooperated by training personnel in lentil production, seed processing, and technology transfer. Germplasm exchange led to the release of an improved cultivar. The Government provided incentives to growers, including inputs, seeds, and fertilizer, as well as credit loans. and declared a favorable price for lentils. An extension program brought information to farmers. In addition, ICARDA facilitated linkages between Sudan and Syrian processors, so that Sudan could benefit from processing techniques used in Syria. Sudan then successfully modified the widely used sorghum dehuller for lentil use. As a result of these joint efforts, Sudan achieved self-sufficiency in lentil production.

Working in Partnership to Increase Yields

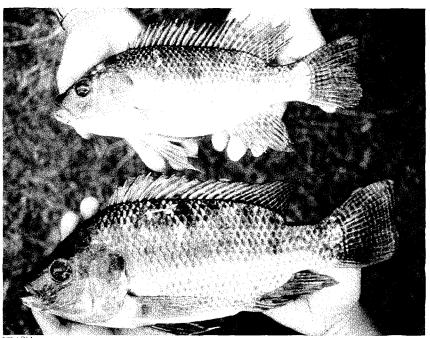
Maize. CIMMYT collaborates with maize researchers working on sustainable maize farming in nine countries in Central America and the Caribbean. Through the Regional Maize Program new maize varieties are adapted to fit local conditions, crop management techniques are refined and disseminated, and national programs are strengthened. CIMMYT provides a high level of technical support to the program. Through research and networking among scien tists, close contacts with national institutes, and local training groups, farmers are provided with environmentally-friendly means of increasing maize productivity.



Mangrove Swamp Rice. To improve rice productivity in mangrove swamps, WARDA, in collaboration with national programs in Guinea, Guinea-Bissau, The Gambia, Sierra Leone, Nigeria, and Senegal, tested many varieties of improved rice for suitability to a range of mangrove swamp growing conditions. WARDA lines were best performers in on-farm tests, outvielding local varieties by 35 percent. In two regions of Sierra Leone and Guinea, adoption rates have increased rapidly and farm-level benefits have amounted to over \$14 million in the test areas alone.

Pearl Millet Close collaboration between ICRISAT and national research institutions in India has resulted in improved pearl millet on 3.5 million hectares—one-third of the total pearl millet growing area in India. Use of the three ICRISATderived cultivars has resulted in more than \$54 million worth of extra food a year. ICRISAT and Indian institutes have further collaborated on the development of improved pearl millet varieties tailored to high stress conditions, especially heat, using crosses of local materials with improved breeding stocks of African origin.

Wheat ICARDA and the Egyptian national wheat research program have collaborated to transfer improved wheat technology to Upper Egypt, an

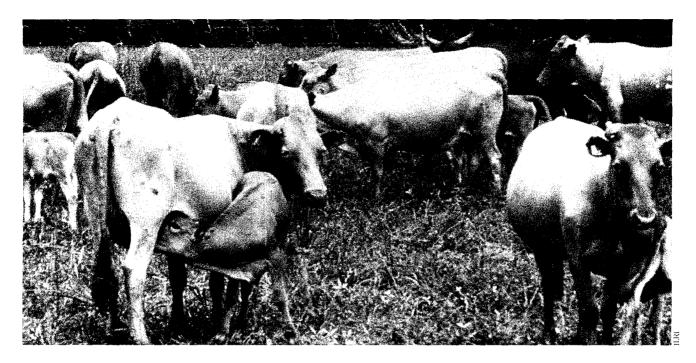


ICLARM

area that accounts for about 24 percent of the total wheat area in Egypt and where wheat is the most important winter crop. Relative to the rest of Egypt, however, wheat yields in Upper Egypt have historically been very low, due in part to inadequate access by farmers to extension information and appropriate inputs. Through the joint efforts of ICARDA and the national program, a package of improved technologies, including new wheat varieties and farming practices, was developed and disseminated directly to farmers. Farmers participating in farmer-managed demonstrations realized a 50 percent increase in wheat yields. In Upper Egypt as a whole, the adoption of the new technology package has resulted in an increase of 50 percent in average real gross income per hectare, most of which is due to yield increases.

Super Tilapia Working in collaboration with the national program in The Philippines, ICLARM has been instrumental in developing the Super Tilapia, a new strain of the tropical, freshwater fish, Tilapia, that is extensively farmed. To develop the Super Tilapia, eight varieties of Tilapia were collected and crossbred. From these, a simple pure breeding strategy of the fastest growers led to the Super Tilapia, which grows 60 percent faster and has a 50 percent better survival record than the Tilapia. With this growth rate, three harvests per year are possible. All work was conducted at Philippine national facilities.

Dairy Production. Dairy products are in short supply in



coastal Kenya. Working with the Kenya Agricultural Research Institute, ILRI has helped to increase smallholder dairy production. Milk yields have risen by 40 percent. Alley cropping systems, which combine food crops and forage grasses with shrubs and legumes, have increased food production and cattle weight. ILRI is also testing a new vaccine for East Coast fever.

Connecting Small Farmers and Scientists

Understanding Small Farmers

In collaboration with NARS, CGIAR Centers are working to understand small farmers and provide solutions to fit their resource poor circumstances. Farming systems research for understanding small farmer decisionmaking, and experiments in farmers' fields to

obtain results where farmers actually operate, have been two landmark steps in the evolution of this research process. For example, in its On-Farm Client Oriented Research project, ISNAR studied pilot efforts to manage the linkages between small farmers and researchers. It used the lessons learned as the basis for training and advice to national institutions to improve the interactions between their scientists and small farmers.

Improving the Relevance of Research Recent efforts have focused on drawing farmers directly into the research process. In West Africa WARDA, working in collaboration with NARS in the region, sought a greater understanding of farmers' perceptions of the seriousness of weeds in rice cultivation. Ninety percent of rice

farmers surveyed agreed that weeds influenced their choice of land to cultivate, and 80 percent said they would extend their area of cultivation if weeds were less serious. By listing the most important weeds in rice cultivation, farmers provided a basis for improving the relevance of research on weeds in rice.

Ensuring **Appropriate** Technology through Farmer Participation. In Rwanda CIAT and the national program invited farmers to the research station to make their own selections of beans. The performance of farmer selected and breeder selected lines were compared. Lines selected by farmers performed better than lines selected for farmers by breeders, even when judged on the criteria breeders used in their own selection process.

Farmers had a much better knowledge of the characteristics required by bean plants to flourish in the particular local circumstances of their own villages. This experience offers hope for a solution to the long standing problem of coping with the vast diversity of dryland farming situations with limited research resources. The solution: bring farmers into every stage of the research process to ensure appropriate technology.

Collaboration with NGOs.

Over the past two decades, the importance of NGOs in development efforts has grown, particularly in the fields of agriculture, natural resources, and the environment. A sizable number of NGOs are involved in technology generation and transfer. Collaboration between CGIAR Centers, NARS, and NGOs joins complementary activities and makes more efficient and effective use of the limited financial resources available for agricultural research. ISNAR recently conducted a survey of Centers and their collaboration with NGOs. Preliminary findings indicate that the Centers collectively collaborate with over 300 NGOs worldwide, including farmers' groups, religious groups, and national, regional, and international organizations. Over half of these NGOs are working in Africa. Collaborative efforts span many disciplines, of which the environment, food crops, natural resources, livestock, and rural development are the top five. The most frequent areas of col-



TRRI

laboration include Center and NGO research agendas, linking with farmers, extension, and NARS, and global concerns. Most often this collaboration occurs in outreach programs and in research, representation in meetings, training, and the supply of seeds.

PROTECTING THE ENVIRONMENT

The CGIAR is working to protect the environment through the conservation of biodiversity, biological control of pests and diseases, and better management of natural resources.

Conserving Biodiversity

Genebanks Conserving the biological diversity of plant species is one of the CGIAR's primary functions. IPGRI's work in helping NARS to develop conservation collections has already been mentioned. The

CGIAR Centers hold in trust for the future one of the world's largest collections of ex situ plant genetic resources. Over 600,000 samples of crop, forage, and pasture species—over one-third of the collected samples in the world—are maintained in CGIAR Center genebanks. The collections include improved varieties and, in substantial measure, the wild species from which those varieties were created. The CGIAR



was the first to place its collections under the auspices of FAO as the basis of an international network of *ex situ* collections.

Sharing Material. Duplicates of the materials stored in CGIAR Center genebanks are freely available to scientists worldwide so that new gene combinations can be brought to bear on current research problems. The CGIAR also provides duplicate samples to restock national collections that have deteriorated or been lost due to civil strife or famine. Cambodia, for example, a valuable collection of rice genetic resources, gathered 30 years ago and containing more than 5,000 traditional rice cultivars, had disappeared. In 1994 IRRI began repatriating a complete set of the lost collection which it had stored in its genebank. Similarly, in a previous effort, IRRI helped reintroduce to Cambodia rice seeds that had disappeared during the long civil war. The lost varieties are now grown extensively throughout the country. IRRI has also repatriated seeds to The Philippines, Sri Lanka, Indonesia, and Thailand.

Tropical Forests. The emerging awareness that tropical forests are some of the richest reservoirs of biological diversity has created a new role for forest science in developing management options that ensure the maintenance of biodiversity. CIFOR is developing an ap-









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proach to assessing biodiversity in forests using cost-efficient methods of survey based on indicator groups. Through this work, CIFOR aims to forecast the likely environmental impact of specific land uses on biodiversity, for the purpose of monitoring forest quality and improving conservation planning.

Integrating Efforts. IPGRI acts as a facilitator, a catalyst, and increasingly as a strategist for the CGIAR's global genetic resources effort. It is the lead Center for the CGIAR's new systemwide program on genetic resources, through which all Center activities on genetic resources will become more integrated. IPGRI also serves as the primary resource for dialogue between the CGIAR and the community at large on genetic resources issues, for example, intellectual property rights and biosafety. In 1994 the CGIAR established a Genetic Resources Policy Committee to advise on policy matters related to genetic resources issues and to assist the Chairman in his role as ambassador for the CGIAR in its relations and negotiations with other institutions.

Biological Control of Pests and Diseases

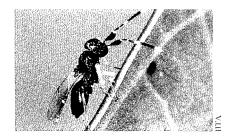
Through the biological control of pests and diseases, the CGIAR is helping farmers to reduce their reliance upon and use of pesticides. This contributes to sustainable farming

practices that are safer for the environment and which protect the health of farm workers, farm families, and consumers. One of the most well known examples of the CGIAR's work in this area is the development by IITA, in collaboration with CIAT, of a biological pest control for the cassava mealybug in Africa. Many of the poor in Africa depend upon cassava for their basic diet. The cassava mealybug destroyed a large part of the cassava harvest until efforts, spearheaded by IITA, led to a biological pest control that resulted in saving the harvest of millions of farmers. Parasitic wasps-natural enemies of the cassava mealybug—were multiplied and released in over 160 sites in 20 tropical African countries, spreading to more than 2.7 million square kilometers in the 25 countries of Africa's cassava belt. It is estimated that for every dollar invested in this research, Africa has gained \$149 in the value of cassava saved.

Other notable achievements by CGIAR Centers in the area of biological control of pests and diseases follow.

Cassava CIAT has collaborated with Brazilian colleagues on the development of a biological control method for use against the cassava hornworm. CIAT isolated a virus that is deadly to the hornworm, but which is harmless to other insects. By mixing dead caterpillars infected with the virus













and water, farmers can produce an effective and cheap antihornworm mixture. When applied to cassava plants, this natural pesticide is ingested by healthy hornworms and causes their death in two to five days. This experimental and environmentally friendly integrated pest management technique has been successfully employed by farmers on 34,000 hectares in Brazil

Chicknea. ICRISAT and ICARDA have jointly developed high-vielding chickpea lines resistant to ascochyta disease. which causes losses of up to 40 percent. Some 50 new cultivars released in 19 countries have helped stabilize production and have made winter sowing possible in the Mediterranean region. Chickpea sown in the winter yields 50 to 100 percent more than when sown in the spring. If widely planted, the new cultivars could result in \$500 million in annual benefits to farmers.

Plantain In Sub-Saharan Africa, plantain is both an important staple crop and an income provider. Here the black sigatoka fungus, which originated in the Pacific, reduces yields by 30 to 50 percent, and is considered the most serious constraint to plantain production. IITA has developed hybrid plantain varieties resistant to black sigatoka that produce more than twice the yield of previous varieties. Use of these hybrid varieties by farmers has increased their food security and household income and has

reduced their dependence on chemical control strategies. For its pioneering research, IITA was awarded the CGIAR King Baudouin Award [see page 24].

Potato. CIP has developed, in partnership with an international consortium of researchers, a new potato variety to reduce the heavy use of pesticides normally required for potato production. The "hairy potato" is named for the hair on its leaves which secretes a sticky substance that traps and kills a range of insect pests as they feed or reproduce, including the potato tuber moth, aphids, and the Colorado potato beetle. The hairy potato controls 50 to 95

percent of pests that constrain potato production. CIP's role has been that of an initiator, catalyst, and research partner.

Sorghum Sorghum midge causes annual losses of more than \$300 million in India, Yemen, and Africa. A midgeresistant variety developed by ICRISAT yields 50 to 100 percent more sorghum than commercial varieties in areas where midge is endemic. The resistant variety also reduces the use of insecticides by farmers. Within the next 2 to 3 years, midge resistance will also be transferred by ICRISAT to hybrid sorghums.



Wheat CIMMYT has developed a wheat that is resistant to leaf rust, for centuries the most destructive disease of wheat. The fungus that causes the rust has the ability to mutate into new, more destructive strains. Average losses to this disease amounted to over 5 million tons annually in the developing world—worth \$750 million and even more when a leaf rust epidemic erupted. CIMMYT researchers achieved durable natural resistance to leaf rust by crossing known resistant varieties with others. The continuous crossing enabled the incorporation of a complex of resistant genes in the new wheat varieties. There have been no reports of leaf rust epidemics anywhere in CIMMYT-derived wheats that contain the new gene complex.

Pastures CIAT has identified, in collaboration with ILRI and colleagues from national institutes in Brazil and Africa, 27 accessions of two pasture species with high levels of resistance to the spittlebug, an insect that has devastated large tracts of tropical America's most productive and popular commercial variety of grass. The spittlebug's larvae feed off of the juices of the roots, stems, and leaves of grass, leaving once productive pasture with grass that is scorched and withered, as if by severe drought. The spittlebug is estimated to have desiccated about 10 million hectares or 20 percent of Brazil's improved pastures. Losses to the livestock sector in tropical America have been calculated at \$60 per hectare. The 27 resistant accessions were identified from nearly 800 accessions collected in six African countries. The challenge now is to transfer this resistance to the more productive and better adapted genetic background of the popular commercial variety in tropical America.

Better Management of Natural Resources

The CGIAR is pioneering an ecoregional initiative aimed at managing agriculture in ways that are more beneficial to the environment. Through this initiative and other programs, the CGIAR is working to identify and spread better management practices to halt the degradation of natural resources and foster the sustainable use of the Earth's finite resource base.

Tropical Forests Slash and burn agriculture in tropical forests threatens indigenous farmers as well as people worldwide—carbon emissions are enormous, biological diversity decreases, and pharmacological potential is lost as plant species become extinct. ICRAF is spearheading the Alternatives to Slash and Burn initiative, a consortium of 18 partners working to find solutions to tropical deforestation. The goal of the

initiative is to provide farmers with alternatives to slash and burn to sustain production from a fixed land area by rotational cropping supplemented by the use of organic and inorganic fertilizers. This will help reduce encroachment on remaining forest lands.

CIFOR is working to rehabilitate forest areas degraded by deforestation and overgrazing, and to support the sustainable management of existing forests for multiple purposes. By planting select species shown by research to fit local conditions and needs, the productivity of forests can be restored. This system of tree management reclaims abandoned lands and provides essential tree products, thereby improving the quality of life of rural people. Sustaining the value of natural forests before they are depleted preserves biological diversity, while providing a sustainable livelihood for forest dwellers and people living on the margins of the forest.

Coral Reefs Coral reefs are the counterparts in the sea of tropical rainforests on land. Coral reefs are being decimated by those, driven by poverty, who use destructive means to catch fish that shelter and feed on the reefs. ICLARM and its collaborators are seeking ways, acceptable to fishermen, of rehabilitating reefs to restore their amazing productivity.



Activities include documenting the size and condition of reef areas, understanding the social, economic, and political factors influencing human behavior impacting upon reefs, monitoring the status of coral reefs, and examining the role of marine sanctuaries in protecting and restoring stocks of reef organisms.

Soil. ICRAF is one of the Centers working to reverse the loss of arable land caused by declining soil fertility. In many parts of Africa, low farm income, which precludes the use of long fallows to restore nutrients to soils depleted by intensive cultivation, and the high cost of fer tilizer pose serious threats to the

soil. ICRAF's research shows that fast growing leguminous trees and shrubs, which have very deep roots, can help restore soil fertility. Nitrogen is amassed in their leaves through biological fixation from the air and from nitrates captured deep in the subsoil. When planted on farms, in either short fallows or relay cropping, they return nitrogen to the soil through leaf litter. In Zambia yields of maize grown after tree fallows of only two years doubled those on land that was continuously planted. Areas where maize was relay cropped with leguminous trees showed a more than doubling in yield over those where maize was not fertilized.

Land and Water. HMI's program on Shared Control of Natural Resources is developing innovative means of arresting resource degradation. Through the program farmers are encouraged to conserve land and water resources and adopt sustainable management practices. This involves: providing protection incentives and other resource conservation measures to users; helping resource users and government officials internalize the concept of environmental protection in their decisionmaking; contributing to the data available on the current state of land and water resources; and strengthening institutional ability to approach resource management in an

integrated manner. Land and water management activities are being conducted on two pilot watershed sites in Sri Lanka, where cultivation without conservation and the removal of trees for timber has caused severe soil erosion on steep slopes and stream banks. Through IIMI's program farmers have gained access to conservation measures, such as regenerating forest cover and planting stream gardens.

IIMI has also launched a global initiative on water management research. A joint effort of IIMI in collaboration with ICARDA, IFPRI, IRRI, and WARDA, and a range of other research institutions outside of

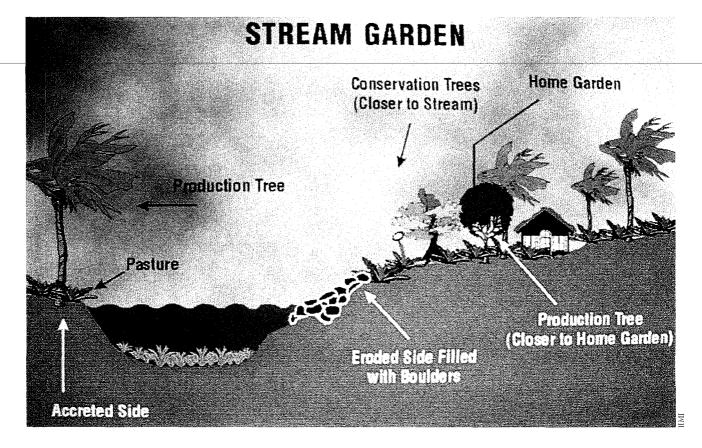
the CGIAR, this initiative will address future scenarios on water supply for agriculture, efficient water use and food supply, the conservation of water resources, the effects of climate change on water resources, and policy improvement. IIMI will convene an international workshop in September 1995 to prepare a framework for action.

IMPROVING PRODUCTIVITY

CGIAR Centers focus their research on increasing the productivity of both high-potential areas and marginal areas. Increasing the productivity of harvests on high-potential lands reduces the pressure for poor

farmers to cultivate fragile lands, cut down tropical forests, and deplete aquatic resources. Nevertheless, population growth and limited high-potential agricultural land does push farmers to cultivate marginal lands prone to drought or rapid degradation. The CGIAR works provide farmers with improved technologies tailored to high-potential areas and others to the uncertain rainfall and poor soils of marginal areas. The CGIAR also focuses on improving the productivity of livestock, forest, and aquatic resources.

Increases in the demand for food, combined with growing land and water shortages,



encourage farmers in developing countries to adopt scientifically improved farming methods. Combining these new methods with the farmers' indigenous knowledge has increased productivity, creating the additional food that feeds approximately 1 billion people in developing countries everyday. The production of 10 major staple food crops in developing countries, for example, has increased by 74 percent since the early 1970s. Yield increases from research and technology contributed 70 percent to this growth in output.

Staple Food Crops

Rice. Rice is the most important food crop in developing countries, constituting one-

third of total food demand for 75 percent of the population in the developing world. Total demand for rice is expected to increase by 70 percent over the next 30 years due to population growth. IRRI is developing a line of "super rice" that is expected to raise yields significantly above current high-yielding varieties. The new plant type was conceptualized in 1988, and breeding work started in 1989, when about 2,000 rice varieties from IRRI's genebank were grown to identify donor plants for various traits. Hybridization work began in 1990. Since then more than 1,300 crosses have been made. about 65,000 breeding lines produced, and plant types with desired traits selected. The new

"super rice" plant type became available in 1994. The prototypes developed have a reduced number of stems or tillers that bear grain, but more grain per tiller, with all tillers productive. The grain-to-straw ratio has been improved from 50 percent to 60 percent grain. Scientists at IRRI are field testing the prototypes, and conducting additional research to breed resistance to pests and diseases into the new plant type. IRRI estimates that, once made available to farmers. the super rice could vield 25 percent more grain under ideal conditions than current highyielding varieties, produce 100 million more tons of rice per vear than is now grown, and help feed an additional 450 million people a year.



2

Potato. In many tropical and subtropical areas of the world, the cost and availability of high-quality seed potatoes for planting is a major limiting factor to potato production and consumption. Seed potatoes can also carry infection, such as a new late blight fungus that has spread to all major potato growing areas in the world. CIP has been improving true potato seed technology to provide a low-cost alternative to vegetative propagation, and has been instrumental in providing true potato seed of hybrid varieties to farmers in developing countries. From this seed, which is free of fungus, farmers can grow their own seedling tubers for planting at a lower cost. In India, for example, CIP estimates that the use of true potato seed could double production over the next 10 years, while reducing production costs by 50 percent in many areas.

Maize. Half of the land planted to maize in developing countries lies in drought prone areas. This places harvests at risk of climatic variations. During drought, the emergence of tassels and silks on maize plants is not synchronous, inhibiting pollination. CIMMYT has crossbred hundreds of varieties of maize to develop tropical varieties that flourish despite drought. Beginning with a variety that was already well adapted to tropical lowlands, CIMMYT researchers have bred this variety under drought conditions, selecting at flowering



for further breeding those plants in which silk and tassel development most nearly coincided. CIMMYT found that these plants produced more grain with less moisture. The new varieties developed can produce 40 percent more maize under drought conditions. They also yield up to 10 percent more during nondrought seasons, and, if planted widely, could feed an additional 50 million people each year. CIMMYT estimates that as many as 20 countries could begin fullscale production with the new maize varieties during the next 10 years.

Cassava New cassava varieties that double and triple current yields in Africa are being developed and tested by IITA. Such advances in the breeding of cassava, the main food staple for 200 million Africans, promise to help reduce food shortages on the continent. The new

"super cassava" varieties have multiples of the normal complement of chromosomes, and are highly efficient in photosynthesis. As a result, super cassava varieties produce yields of up to 40 tons per hectare. Cassava with more chromosomes also offers the possibility of breeding varieties with improved nutritional and other qualities.

Wheat. Wheat, both irrigated and dryland, is the most important field crop in Syria, with bread and other wheat products forming the basis of the national diet. Population growth has resulted in increased demand for wheat, which has been met through costly imports. To achieve self-sufficiency in wheat, the Syrian Government joined in partnership with ICARDA to develop higher-yielding wheat varieties and associated agronomic packages targeted to specific agroen-

vironments. As a result of this collaboration, seven new varieties of wheat have been released to farmers along with recommended management practices. The program has met with remarkable success. Average yields more than doubled, and production tripled, despite a decline in area under production. Varieties jointly developed by ICARDA now cover about half the total wheat area in Svria. ICARDA estimates that the adoption of modern wheat production technology throughout Syria has resulted in an increase of \$260 million per year in national income.

Livestock, Forest, and Aquatic Resources

Crossbred Dairy Cows. ILRI has been studying the use of crossbred dairy cows as draft animals. In Africa, draft oxen are worked for only short periods during the year, primarily for land cultivation and thresh-

ing. Using crossbred dairy cows for traction benefits total farm animal production by alleviating the need to maintain draft oxen vear-round and a follower herd to replace the oxen. ILRI has found that working crossbred cows that are fed a supplemented diet maintain lactation and reproduction levels comparable to non-working cows. Thus, if properly fed, crossbred dairy cows used as draft animals can produce as much milk as nonworking cows, provide calves. and free the owner from the costs of maintaining oxen.

Cinderella Trees. The domestication and improvement of indigenous tree species holds promise for generating direct income for farmers and as a lasting and practical alternative to slash and burn agriculture. ICRAF is working to collect and propagate these high-value tree resources, dubbed "Cinderella" species since they have been largely overlooked by researchers



and their full potential has vet to be realized. Fruit, medicine. high-grade timber, food additives, oil, fiber, resin, and fodder have long been harvested from trees by farmers, and they often have important local markets. Yet their potential for regional and international markets has been untapped. Such trees include the bush mango, the peach palm, masuka, camu camu, and pygeum. ICRAF is conducting extensive ethnobotanical surveys to identify farmer preferences for tree species and superior trees. In collaboration with national partners, ICRAF is also collecting tree samples and propagating trees to develop high-quality, productive varieties. The current focus is on indigenous fruit trees, which farmers would like to flower and fruit earlier. As such research is in its infancy. ICRAF is conducting pioneering work on the physiology of aging.



Giant Clams. Giant clams are prized for their meat, which brings a high price, and for their shells, which have many uses. They are also valued in aquarium markets. Research has demonstrated that giant clams can be cultivated. ICLARM scientists conducted trials with the largest species, deemed most suitable for farming near coastal villages, by distributing batches of giant clams to 40 villages in the Solomon Islands. research identified cultivation systems and habitats demonstrating promising rates of growth and survival. Experiments are underway to further reduce the cost of juvenile clams, increase growth and survival at village sites, and to find better ways to transport giant clams alive to distant markets. Similar experiments on five other species of giant clams are underway.

Harvesting and Processing Technology

Medicaga Working in partnership with manufacturers in Syria and North Africa, ICARDA has developed a new system for harvesting the seeds of medicago (widely known as alfalfa or Lucerne). An annual legume, medicago is useful for rehabilitating degraded pasture and marginal lands. Formerly medicago pods were very difficult to harvest. Now, using a sweeper developed jointly by ICARDA, pods are swept from a field into a basket, which is then shaken to sieve out soil and to separate straw from the pods. A second

machine, the pod-thresher, is used to separate raw seed for sowing in a nursery. These simple machines are the basis for the first farmer controlled seed industry in West Asia and North Africa. ICARDA is currently developing a roller for preparing flat seed beds.

grinding, and sifting cassava, and a stove with a fryer. The new machinery is being used by community centers in Nigeria. In two such centers, postharvesting losses were reduced by over 50 percent, the labor requirement by over 70 percent, and fuel consumption by 30 percent.



Cassava Postharvest losses of cassava can exceed 40 percent of the harvested crop in Africa, half of which can be attributed to poor processing techniques. In addition, cassava processing is a very labor-intensive task, performed primarily by women and children. IITA has developed a simple equipment package for cassava processing that reduces postharvest losses, speeds up processing, and improves food quality. The package includes a peeling knife, machines for grating, dewatering, chipping, drying,

REDUCING VULNERABILITY TO FAMINE

The CGIAR is most often identified with long term, strategic research. Its contributions to increasing agricultural productivity in both high-potential areas and on marginal lands has demonstrated that scientific research can directly help fight famine and hunger, and thus make a substantial contribution to improving the subsistence of the world's poor. Less well known are the CGIAR's contributions to reducing vulnerability



to famine, including its efforts to produce food crop varieties with increased nutritional value, its work to improve preparedness through the identification of areas most vulnerable to famine, and its special assistance to help restore agricultural productivity in Rwanda.

Nutrient Enriched Food Crops

Nutrient-poor diets are a major cause of malnutrition in the world. Over 1 billion people are at increased risk of death, blindness, or reduced cognitive ability from deficiencies of iron, vitamin A, iodine, and zinc in their diets. IFPRI is coordinating an effort of CGIAR Centers and the Waite Agricultural Research Institute at the University of Adelaide, Australia to identify cost-effective alternatives for increasing micronutrient intakes. The collaborative effort has two main components: a multi-country effort to breed nutritionally improved staple foods, and the collection and analysis of household data on agricultural production, household resource allocation, and nutrition to provide a basis for policy formulation.

Varieties fortified with minerals have increased resistance to disease and drought, and produce greater yields with less fertilizer and water. For example, a zinc enriched wheat variety grown in Australia can be grown on zinc deficient soils with higher yields than nonenriched wheat varieties. By producing nutrient enriched food crops and identifying policies that encourage the adoption of nutrient-rich diets, this initiative is expected to contribute to long-term solutions to many health problems associated with poor quality diets in developing countries.

Identifying Vulnerable Areas

In a collaborative effort, IFPRI has developed a new model for identifying famine-prone areas that employs a set of indicators to predict vulnerability to

famine. These indicators include average household size, the relative price of crops to livestock, the number of oxen owned by households, road density, and sharp variations in vegetation cover as derived from satellite images. An area that faces high prices of crops relative to livestock, that lacks roads, and that has a high variation in vegetation cover is at a higher risk of famine and is likely to be less well-equipped to take advantage of any systematic intervention that would prevent famine.

IFPRI examined 98 of these indicators across 77 districts in Ethiopia. Data were mapped using geographic information software to identify areas of the country vulnerable to famine. Those areas receiving food aid were mapped as well. IFPRI found that many of the current food security programs in Ethiopia are not directed to areas most vulnerable to famine. Use of this approach can help to better target aid to the most vulnerable segments of the population and to areas where policy interventions can be used to make a difference between life and death.

Seeds of Hope

In Rwanda, where over 90 percent of the population is engaged in agriculture, the recent civil war left devastation and famine in its wake. During the war, food production was severely reduced, and many farmers consumed seeds nor-

mally saved for planting in order to survive. Government services disintegrated and national seed collections disappeared. This hindered the resumption of agriculture and endangered the genetic base of Rwanda's food crops.

In a special effort, the CGIAR turned its know how to help restore Rwanda's agricultural productivity through a joint program to multiply and distribute seeds of Rwanda's six most important food crops. Before the war, these six crops comprised 73 percent of total food

consumed in Rwanda and contributed 80 percent of both calories and protein to the Rwandan diet. Since 1994, the CGIAR's Seeds of Hope program, coordinated by CIAT, has been providing seeds, samples of which were stored in CGIAR Center genebanks. Centers participating in this initiative are CIAT (beans), CIMMYT (maize). CIP (sweet potato and potato), ICRISAT (sorghum), and IITA (cassava) for food crops, as well as ICRAF (tree germplasm), IPGRI (overall genetic resources), and ILRI (seed multiplication). The seeds are being multiplied with the

help of national agriculture programs in Burundi, Ethiopia, Kenya, Malawi, Tanzania, Uganda, Zaire, and Colombia, and distributed by relief organizations.

Through these joint efforts, more than 8,000 tons of seed were distributed by NGOs and aid agencies for planting in 1994, along with food aid, hand tools, and technical advice, to ensure the new seeds were planted and not eaten. As the situation in Rwanda continues to improve, seed multiplication will increasingly take place within Rwanda itself.

Yield Increases of Food Crops

From the early 1970s to 1994, farmers and researchers in the developing world have, with the CGIAR's help, increased the yields of the following food crops:

Rice, to 3.5 metric tons per hectare, a 52 percent increase

Wheat, to 2.4 metric tons per hectare, a 96.1 percent increase

Maize, to 2.6 metric tons per hectare, a 72.1 percent increase

Potato, to 12.7 metric tons per hectare, a 24.6 percent increase

Food Legumes, to 0.7 metric tons per hectare, a 13.2 percent increase

Cassava, to 9.7 metric tons per hectare, a 16.7 percent increase

Yams, to 9.5 metric tons per hectare, a 21.1 percent increase

Barley, to 1.3 metric tons per hectare, a 22.4 percent increase

Millet, to 0.7 metric tons per hectare, a 12.4 percent increase

Sorghum, to 1.1 metric tons per hectare, an 18.3 percent increase

Sweet Potato, to 13.5 metric tons per hectare, a 20.4 percent increase

Source: FAO Statistics Division 1994, including 1994 estimates.

Agricultural Production: Impact and Challenges



Norman E. Borlaug President Sasakawa Global 2000

KEEPING PACE WITH PROJECTED INCREASES IN THE DEMAND FOR FOOD

I am now in my fifty-first year of continuous involvement in food production programs in developing countries. During this period, I have seen much progress made in increasing the yields and production of various crops, especially cereals, in many food deficit countries. My first foreign agricultural assignment was in Mexico, where I participated in developing the wheat revolution of the 1940s and 1950s. In the 1960s and early 1970s, much of my efforts were devoted to increasing wheat production in the densely populated countries of South and East Asia, which at the time were the most critical food deficit and famine plagued areas of the world.

Spectacular increases in the yields and production of cereals and other crops in India, China, Pakistan, Indonesia, and Thailand from 1968 to 1985 made this vast region essentially self-sufficient in basic foods. Much of the research information and plant materials that catalyzed this dramatic change in production, producing huge economic returns, was generated by CGIAR Centers and a predecessor Mexican Government-Rockefeller Foundation agricultural research and production program. Despite a more than tripling in the world food supply over the past three decades, the green revolution in cereal production has not solved the problem of poverty and chronic undernutrition afflicting hundreds of millions of people around the world, who are unable to purchase the food they need, despite its abundance in international markets.

In many of the most productive areas, especially irrigated areas located in warm climates, there are also problems of soil degradation,

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salinity, and declining water quality, which, if left unchecked, can lead to the permanent loss of prime agricultural land. These are not new problems that resulted from the use of highyielding, green revolution technology. In most cases, they date back 50 to 100 years or more. The root cause of much of this environmental degradation has been mistaken economic policy-for example, irrigation systems with no provision for drainage—not modern, sciencebased technology. Low crop yields and little profit have prevented farmers from investing in resource conservation, while excessive subsidies in a few countries have caused misuse and overuse of agricultural pesticides, with resulting environmental damage.

Poets, as well as city folks, love to romanticize agriculture,

portraying it as an idyllic state of harmony between humankind and nature. How far this is from the truth! Since Neolithic women domesticated crop species some 10,000 to 12,000 years ago, agriculture has been a battle between the forces of natural biodiversity and the need to produce more food for more people under increasingly intensive production systems. Through advances in science during the twentieth century, world food supplies have increased more rapidly than population and, in general, have become more reliable.

In 1990 global food production of all types was approximately 4.6 billion metric tons of gross tonnage—about 2.4 billion tons of edible dry matter. Of this, 98 percent was produced on land; less than 2 percent

came from oceans and inland waters. Plant products constituted 92 percent of the human diet, with about 30 crop species providing most of the world's calories and protein. These included 8 species of cereals, which collectively accounted for 69 percent of the world food supply. Animal products, which come indirectly from plants, constituted 8 percent of the world's diet.

The world food production-distribution dilemma can be illustrated as follows. Had total world food production in 1990 been distributed evenly, it would have provided an adequate diet for 6.2 billion people—nearly 1 billion more than the actual size of the global population. However, had the people in developing countries attempted to obtain 30 percent of their calories from animal products, as those in the United States, Canada, and countries of the European Union, only 2.5 billion people could have been sustained—less than half of the present world population.

These statistics indicate two key problems to feeding the world's people. The first is the complex task of producing sufficient quantities of desired food, and to accomplish this Herculean feat in environmentally and economically sustainable ways. The second, equal or even more daunting, task is to distribute food equitably. The impediments to equitable food distribution are poverty and a lack of purchasing power

resulting from unemployment or underemployment, which, in turn, is made more severe by rapid population growth.

At best governments of most low-income food deficit developing countries have foreign exchange to import the minimum amount of food needed to avoid famine and social unrest in urban areas. Yet the problems of hunger and famine are usually greatest in rural areas, where 60 to 80 percent of the population lives. Even if governments had the financial resources to import food for distribution in rural areas, they would be confronted with enormous problems of physically transporting and distributing such commodities among dispersed rural populations in areas often devoid of roads.

Clearly if the problem of world hunger is to be solved, it must begin with expanding food production in low-income, food deficit countries where the majority of the world's hungry people live. Moreover, without the development of agriculture and the achievement of an adequate and reliable food supply, the development of commerce and industry will be forever retarded.

World population will grow by nearly 1 billion people during the 1990s, and by another 1 billion people during the first decade of the twenty-first century. A medium projection estimates that world population



will reach 6.2 billion people by the year 2000 and approximately 8.3 billion people by 2025, before, hopefully, stabilizing at about 10 billion toward the end of the twenty-first century. I, however, am becoming more and more skeptical of such "optimistic" projections.

For the foreseeable future, mankind will continue to rely on plants, and especially on cereals, to supply virtually all of its increased food demand. Even if current per capita food consumption stays constant. population growth will require that world food production increase by 2.6 billion gross tons, or 57 percent, between 1990 and 2025. However, if diets improve among the hungry poor-estimated to be 1 billion people, living primarily in Asia and Africa—world food production demand could increase by 100 percent to 9 billion gross tons over this 35-year period. Moreover, this production increase must be achieved in environmentally sustainable ways.

To achieve this goal will require the continuation of aggressive research across many scientific disciplines by both CGIAR Centers and NARS to develop progressively more efficient and higher-yielding packages of improved crop production practices. Similarly, the efficiency of technology transfer from research centers to farmers' fields by national agricultural extension systems must be greatly improved.

KEEPING CGIAR SCIENCE RELEVANT

The CGIAR Centers have undoubtedly played an important role in increasing world food production, but what about their future? The late Dr. F. F. Hill, former Vice President of the Ford Foundation and one of the forces behind the creation of both the first four international agricultural research centers and subsequently the CGIAR, told me in 1968 when we were traveling together in Pakistan viewing the tremendous impact of green revolution wheat production technology, "Enjoy it! Such dramatic changes in yield and commercial production are rare, once in a lifetime events." He said he was pleased to see the key role the Centers were playing to bring both the wheat and rice revolutions to fruition, but he went on to warn, "I doubt the Centers will have more than 25 years of highly productive life

before succumbing to the twin ills of bureaucracy and complacency." If this happened, Dr. Hill thought, it would probably be easier to build a new set of institutions, rather than to try to reform the existing ones. I often ask myself, when reflecting on the current problems of the CGIAR, is Dr. Hill's prediction coming true? I hope not, but I must confess I am fearful. We must not let it happen!

Although scientists at CGIAR Centers and NARS certainly have advanced the frontier of knowledge over the past three decades, I believe their more significant contribution has been the integration of knowledge across scientific dis-

ciplines and its application in the form of improved crop production technologies to overcome pressing crop production problems. This should continue to be their mission. Moreover, impact on farmers' fields and the alleviation of rural poverty—rather than the number of learned publications generated—should be the primary measure by which the value of CGIAR and NARS work is judged.

Unfortunately, agricultural science, like many other areas of human endeavor, is subject to changing fashions and fads, generated both from within the scientific community and imposed upon it by external





forces, especially those that are politically induced which affect the actions of donors. In my own career, I have seen various scientific bandwagons come and go. In the 1930s and 1940s, plant improvement through the development of polyploid varieties (i.e., the doubling of chromosomes) was promoted as the panacea. By the 1950s and 1960s, mutation genetics was the rage. In the 1970s and 1980s, anther culture, somatic tissue culture, and farming systems research were the craze. In the late 1980s and 1990s. biotechnology and genetic engineering, computer modeling of cropping systems, maximizing biodiversity, low-input, sustainable agriculture, and particularly

farmer research have been in vogue.

Each of these lines of research has had, or will have, some beneficial aspects. All have something else in common: their proponents, certainly partly driven by the desire to secure research funds, have too often exaggerated the potential for benefits in new specialized spheres of research, especially in the near-term. Increasingly, I fear, the CGIAR Centers are falling prey to highly specific scientific bandwagons that will not do much to solve food production problems in developing countries.

Some of the recent downsizing in the CGIAR, while

painful, has probably been for the better, since many Centers had grown too big and bureaucratic. In this process, however, staff morale has declined considerably. One disturbing aspect of the reduction in the core budgets of the Centers, while special project funding was not affected, has been the distortion brought to overall program plans. As a consequence, friction has increased between different members of Center research teams. More broadly, the perception that good career opportunities no longer exist within the CGIAR System needs to be dispelled. Twenty-five years ago, Centers were able to attract the best and brightest young scientists, who

wanted to direct their talents to help solve developing country agricultural problems. Is this still true today?

The CGIAR Centers should retain the best and brightest of their staff for as long as they can. The notion of forced staff turnover, following a rigid formula, is one of the craziest and nonsensical ideas I have ever heard. Outstanding senior staff members are much more than scientists. They also have strong communication skills and a good understanding of development in general.

Center research managers and decisionmakers need to spend more time on the ground, monitoring what is happening, or not happening. Furthermore. Center researchers must strengthen their interactions with NARS, national agricultural extension systems, and farmers, both large and small. Too many have become detached from the realities in farmers' fields, preferring to measure their achievements by the information and products generated, and learned papers published, rather than by assuring the adoption of their technologies in the countryside to increase

food production. This should be changed.

AGRICULTURAL EXTENSION

Extension has been mentioned, but this process of technology transfer to the small farmer deserves a few more words. While the generation of new technology is essential, it is technology transfer which is currently the weakest link in the research-extension-farmer chain. Imaginative solutions, drawing upon the experiences of the many development strategies tried over the past 100 years, are required. Their appli-



cation will not be easy or inexpensive.

LINKING CGIAR RESEARCH AND PRODUCTION

The transfer of research results from CGIAR Centers to farmers in developing countries is heavily dependent upon the capacities of publicly funded national research and extension systems. Privately funded agribusiness is only playing a very small role in technology generation and transfer in African countries at present. Consequently, publicly funded efforts must still be the central components in any strategy to reach the small-scale farmer.

Any strategy to maximize investments in technology generation and transfer must, there-

fore, find ways to fund adequately and with stability the CGIAR Centers, NARS, and national agricultural extension systems. Funding one without the others will not result in significant impact. Rather there is a need to jointly finance all three and to maximize the potential from scientific networking between researchers and extension workers at Centers and outstanding NARS and national agricultural extension systems. In particular, it is essential that outstanding national researchers have adequate funds to engage fully in cooperative research with the international scientific community.

One of the important functions of CGIAR Centers is to serve as hubs of various research networks. In addition to research collaboration on specific problems, Center networking functions include germplasm development, regional agronomic research, and information exchange. This should include a continuing program of practical in-service training for early and midcareer researchers from national programs, as well as opportunities for senior level visiting scientists.

The key point here is that, for a network to function properly, there has to be a lot of interaction between the members of the network. Even with all of the advances in information technology, there is still no substitute for face-to-face contact. This means that NARS scientists need to visit Centers regularly, and Center scientists need to spend significant time visiting national program scientists and touring agricultural production areas.

CONFUSION IN POLICY CIRCLES

Professor Robert Paarlberg of Wellesley College has written an IFPRI Policy Brief, which describes succinctly the consequences of the debilitating debate between agriculturalists and environmentalists about what constitutes sustainable



Paar'berg, Robert L. 1994, "Sustainable Farming: A Political Geography," 2020 Brief 4(August). International Food Policy Research Institute, Washington, D.C.



agriculture in developing countries. This debate has confused, if not paralyzed, policymakers in the international donor community who, afraid of antagonizing powerful environmental lobbying groups, all too often have turned away from supporting science-based agricultural modernization projects so urgently needed in Sub-Saharan Africa and parts of Latin America and Asia.

This policy deadlock must be broken. In doing so, we cannot lose sight of the enormous job of feeding 8 to 10 billion people. We cannot turn back the clock. The vastly different circumstances faced by farmers, large and small, in different parts of the developing world, requiring different policy postures, must also be recognized. For example, in Europe and in the U.S. Corn Belt, the application of 300 to 500 kilograms of fertilizer nutrients often partly from animal manure—per hectare of arable land can occasionally result in some local environmental problems. Surely, increasing fertilizer use in Sub-Saharan Africa from 10 kilograms of nutrients per hectare-mostly applied to export crops, such as coffee, tea, cocoa, cotton, pineapple, and bananas—to 30 to 40 kilograms per hectare of arable land is not an environmental problem, but a central component in Africa's environmental solution.

In Asia, where fertilizer use has risen markedly in the last two decades driving the rapid growth in grain production, the nutrient demands of further increases in food production cannot be met without recourse to chemical fertilizer. Research on improving fertilizer use efficiency and recycling organic matter, including human waste, can help, but these means can

never meet more than a fraction of the nutrient demands. China. for example, historically the most skillful, efficient, and extensive user of organic fertilizers, including animal manure. human excrement, composted crop residues, and silt from rivers and canals, has also become in the last decade the world's largest producer and consumer of chemical nitrogen fertilizer. China is also the second largest consumer and third largest producer of chemical phosphatic fertilizers. As a result, China today is the world's largest producer of cereals—an achievement it could never have attained without the use of chemical fertilizers.

Another example of the confusion among policymakers is the extent to which fertilizers are lumped in with pesticides in public debate on policy related to agrochemicals, where all pesticides are considered equally dangerous and modern agriculture is branded as polluting. Yet has anyone thought what the development of disease and insect resistance in modern varieties has done for reducing pesticide use? This confusion prevents logical debate on the risks and alternatives that agricultural research has provided mankind.

We have failed to educate policymakers about the strong linkages in the developing world between population, primitive agricultural production methods, environmental degradation, and rural poverty. Without a doubt, the reduction in rural poverty among small-scale farmers is a necessary condition for improved resource conservation and lower population growth. As Mr. Richard Leakey correctly pointed out, "You have to have at least one square meal a day to be a good conservationist or environmentalist." Take, for example, the land-saving effect of employing high-yielding food production technologies to increase output over the last 30 years. By being able to feed many more people from each



hectare of land suitable for high-yield agricultural production, many hectares of environmentally sensitive land have been saved. Do most environmentalists and policymakers realize this?

The United States is an illustrative example of this. In 1940, the production of the 17 most important food, feed, and fiber crops totaled 252 million tons from 129 million hectares. Compare these statistics to 1990, when American farmers harvested approximately 600 million tons from only 119 million hectares—10 million hectares less than 50 years earlier. If the United States had attempted to produce the 1990 harvest with the technology that prevailed in 1940, it would have required an additional 188 million hectares of land of similar quality. This theoretically could have been achieved either by plowing 73 percent of the nation's permanent pastures and rangelands or by converting 61 percent of forest and woodland areas to cropland. In actuality, since many of these lands are of much lower productivity potential than those now planted with crops, it would have been necessary to convert a much larger percentage of pastures and rangelands or forests and woodlands to cropland. Had this been done, imagine the additional havoc from wind and water erosion. the obliteration of forests, the extinc-

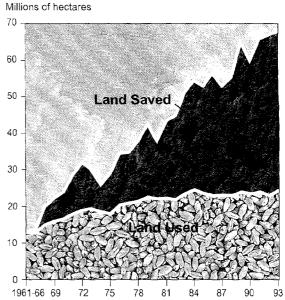
tion of wildlife species through the destruction of their natural habitats, and the enormous reduction in outdoor recreation opportunities that would have resulted.

use have also accrued in China and India through the applicaal yields of 1961 still prevailed in 1992. China would have needed

> to increase its cultivated cereal area by more than three-fold, and India by about two-fold, to equal 1992 harvests. Clearly such a surplus of agricultural land is not available.

last 8 to 10 years,

Land Saved with Modern Wheat Varieties in India



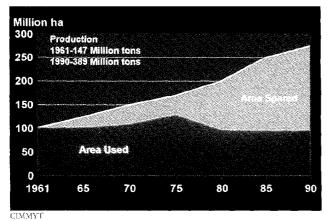
Impressive savings in land tion of modern technologies to raise crop yields. Had the cere-

Within the

research has developed new appropriate technologiesbased on liming combined with appropriate fertilization, and the development of aluminum tolerant crop varieties of pasture grasses, sovbean, rice, maize, wheat, and several tree species—that have opened, or will open, vast areas of acid oxisols in Brazil. Colombia, and several African countries to successful cultivation. The application of new improved technology, if supported by continuing research, promises a huge increase in food production over the next three to five decades.

Twenty-five years ago, in my acceptance speech for the 1970 Nobel Peace Prize, I said that the green revolution had won a temporary success in man's war against hunger, and which, if fully implemented, could provide sufficient food for

Land Saved with Modern Cereal Varieties in China



humankind through the end of the twentieth century. However, I warned that, unless the frightening power of human reproduction was curbed, the success of the green revolution would only be ephemeral.

So far agricultural research and production advances, and the efforts of the world's farmers, have kept gains in food production ahead of aggregate world population changes. However, there can be no lasting solution to the world food-hungerpoverty problem until a more reasonable balance is struck between food production and distribution and human population growth. The efforts of those on the food production front are, at best, a holding operation which can permit others on the education, medical, family planning, and political fronts to launch an effective and sustainable human attack to tame the population monster.

Agricultural scientists, responsible environmentalists, and policymakers have a moral obligation to warn the political, educational, and religious leaders of the world, as well as the general public, about the magnitude and seriousness of the arable land, food, population, and poverty problems that lie ahead. If we fail to do so in a forthright manner, we will be negligent in our duty and will



inadvertently contribute to the pending chaos of incalculable millions of deaths from starvation. The problem will not vanish by itself. To continue to ignore it will make a future solution ultimately more difficult to achieve.

The Users' Perspective



Fawzi H. Al-Sultan President International Fund for Agricultural Development

TECHNOLOGY DEVELOPMENT FUNDAMENTAL FOR MEETING FUTURE FOOD NEEDS

Ifow to harness technology to help spur agricultural growth that is both environmentally sustainable and equitable is the main issue confronting us today.

A number of worrisome signals suggest that, within the next century, the world may yet again be faced with food shortages. Agricultural research has a crucial role to play in addressing this challenge. How to harness technology to help spur agricultural growth that is both environmentally sustainable and equitable is the main issue confronting us today.

IFAD's experience in developing innovative approaches to combat rural poverty and hunger has made clear the close and mutually reinforcing links among population, poverty, and environmental degradation. These links become most pronounced in resource-poor areas, for which few sustainable agricultural technologies are currently available. Yet the poor have substantial productive capacity, not only for their own self-improvement, but in terms of their contribution to national wealth. This capacity can only be tapped, however, if the poor have access to resources, including technology, relevant to their requirements. Consequently, while recognizing the need for research on high-potential areas, IFAD stresses the importance of giving adequate priority to the development of technologies suitable for poor smallholder farmers.

IFAD has found that such research-induced technological improvements are fundamental to the success of its poverty alleviation strategy. Illustrative cases demonstrate the impact research has had on traditional staple crops produced and consumed by the rural poor; for example, the successful efforts to raise yields in the production of cassava, an important food staple in much of Sub-Saharan Africa, and the cost-effective and environmentally sound methods for African farmers to use in the management of soil and water conserva-

tion, land preparation, and livestock. In Egypt, another example, IFAD invests in projects that draw upon the results of IFADsupported research on costeffective and environmentally sustainable integrated pest management technologies and rice farming systems. Such research offers significant potential for increasing productivity and integrating poverty alleviation and resource conservation in global efforts to combat land degradation, drought, and desertification.

The application of recent advances in biotechnology and the use of innovative techniques to control pests and diseases can also offer tremendous opportunities to increase the production and incomes of the rural poor. This suggests an approach to agricultural research which marries the fruits of frontier research in the areas of biotechnology, genetic engineering, and informatics with the needs and perceptions of the ultimate users, especially small and marginal farmers.

A two-track approach is needed. First farmers must be provided with better basic technology for the traditional crops and farming systems that are the core of their current production systems. Second, biotechnologybased methods must be developed that take into account the perceptions of poor farmers, and which also give them a chance for significant leaps in productivity. To this end, a better understanding is required of the underlying forces and interlinkages in the population-poverty-environment nexus, as well as the development of relevant technologies based on that understanding. Serious multi-dimensional research, undertaken largely by publicly supported institutions, is needed, particularly since the private sector, at least initially, will have little commercial incentive to do so.

In recent years there has been a fresh and welcome recognition of the role of agriculture in providing the foundation for economic growth in developing countries. There has also been a growing understanding of how market forces can help to stimulate agricultural development. On the other hand, there have been some overly optimistic expectations of





what food pricing policies alone can achieve in ensuring a dramatic turnaround in the agriculture sector. The crucial role of non-market factors, particularly investing in agricultural research and technology development and strengthening rural infrastructure and institutions, has been somewhat neglected in strategic policy thinking.

The experience of many countries in fostering the green revolution has helped to establish the credibility and relevance of agricultural research, promoting both the modernization and commercialization of the agriculture sector. The green revolution made a sub-

stantial contribution to food security in many countries. Current technologies of agricultural intensification in irrigated areas, however, have sometimes led to adverse environmental side effects, such as nutrient depletion, salinity, waterlogging, and declining rates of yield increases. Moreover, the green revolution concentrated largely on irrigated farming technologies and tended to bypass poor farmers in rainfed areas. This underscores the urgent need for research to find environmentally sound solutions to the problems faced by poor farmers, in order to reverse the trend of virtually stagnating yield levels.

POLICY ASPECTS REQUIRING INTERNATIONAL CONSIDERATION

There are a number of policy aspects which require the international community's consideration. These include:

e Ensuring that future research priorities take into account the productive potential and needs of smallholders. This is crucial from the standpoint of increasing the production and purchasing power of the rural poor, particularly women farmers, strengthening household food security, and promoting better conservation of the



fragile natural resource base. There is also need for vigorous research on problems of drought and desertification as a followup to the Desertification Convention.

- Responding to the needs of the poor through much stronger communication between researchers and farmers. Researchers cannot simply work toward ideal solutions, but rather must firmly base their work on what smallholders want and are capable of implementing.
- Continuing to emphasize increased productivity through the generation of cost-effective and environmentally friendly technologies for high-potential areas, and fostering information

and technology flows between universities and private and public centers of excellence in developed countries and research systems in the South.

• Generating a strong political will in developing countries and in the international community to treat agriculture and agricultural research as integral parts of national and global development agendas. After all, agriculture, conscientiously practiced, holds the key to both environmental sustainability and poverty alleviation.

On the issue of agricultural research as an investment, IFAD's experience is that returns on investments in agricultural research projects are very high, within a range of 20 to 100 per-

cent. More importantly, in many of the marginal areas in which the poor live, better methods are essential for the poor to gain the possibility of a more secure and sustainable livelihood. The significance of relevant agricultural research thus goes well beyond the issue of rates of returns to the broader question of the survival of large numbers of human beings.

THE NARS PERSPECTIVE

IFAD convened a consultation of NARS leaders in Rome, Italy on December 12-14, 1994. The consultation was a historic occasion, since the last such meeting took place in Bellagio, Italy in 1977. NARS leaders adopted a set of conclusions and recommendations, synthesized in a one-page declaration.

A summary of the main points follows.

The NARS:

- Very much welcome the efforts to revitalize the CGIAR System and to improve its operational efficiency, governance, and financing arrangements.
- Urge that national research systems have a larger voice in CGIAR fora, including proposed global and regional fora, as well as in research priority setting.
- Endorse the ideas of integrating equity, environ-

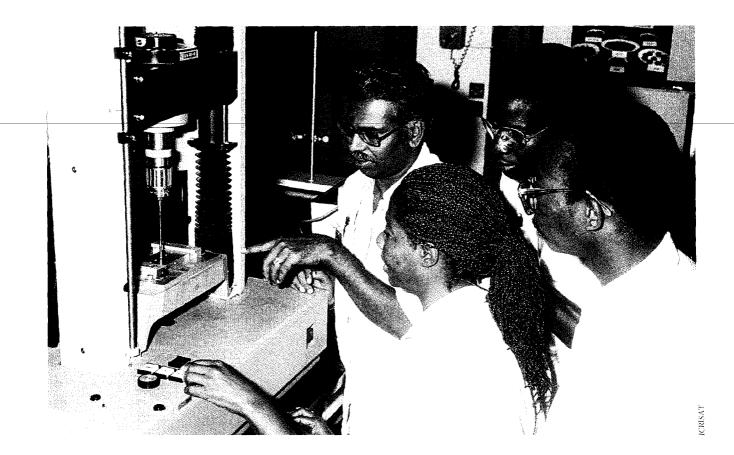
mental, and gender concerns in the CGIAR's future research agenda, and the establishment of strategic partnerships and alliances for undertaking collaborative and participatory research according to respective comparative advantages.

 Call for an energetic follow-up by the cosponsors of the CGIAR to evolve specific mechanisms and

- modalities to operationalize partnerships and provide support for capacity building.
- Appeal to the donor community and their own national governments to give higher priority to agricultural research and to incorporate in their project and program interventions funds to support and strengthen national agricultural research systems.

THE NEED FOR STRONG SUPPORT FOR AGRICULTURAL RESEARCH

There is pressing need for strong policy level support for agricultural research, not only for sustainable agricultural development, but also as a potent vehicle for rural poverty alleviation. We must continue to draw the attention of policymakers to the crucial role of agriculture and agricultural research in responding to the major concerns of our times relating to poverty, population explosion, and environmental degradation.





Toward 1996: The CGIAR Research Agenda



Donald L. Winkelmann Chair CGIAR Technical Advisory Committee

INTRODUCTION

The 1996 research agenda is a step along the way to a restructured CGIAR, that features greater openness and broader participation, and which is more transparently related to the goals of its stakeholders.

The 1996 research agenda, adopted by the CGIAR at its Mid-Term Meeting in Nairobi in May 1995, is the first post-Lucerne research agenda recommended by TAC. It presents an overview of CGIAR programs and budgets in 1996, in the matrix framework agreed to at the Ministerial-Level Meeting in Lucerne.

The 1996 research agenda is a step along the way to a restructured CGIAR, that features greater openness and broader participation, and which is more transparently related to the goals of its stakeholders. Noteworthy is the expansion in the support for systemwide and ecoregional programs and initiatives, as well as the progress made in transferring Center activities from complementary to core programs. As well, the responsiveness of Centers to the evolving needs of the CGIAR is reflected in the changes in the profile of Center and System activities since 1992.

The Lucerne Declaration and Action Program redefined the mission of the CGIAR, and outlined priorities and strategies to enable the CGIAR to fulfill its mission of contributing, through its research, to promoting sustainable agriculture for food security in developing countries via poverty alleviation and protecting natural resources. A new pattern of decisionmaking was endorsed under which the research program and funding needs of the following year will be outlined annually during the Mid-Term Meeting of the current year; for example, at the 1995 Mid-Term Meeting for 1996. This arrangement will enable financing agencies to reach funding decisions between May and October so that

the research agenda can be fully financed when funds are pledged during International Centers Week.

The highlights of the 1996 research agenda that follow are divided into four parts: (i) the broad context within which the research agenda was framed; (ii) an overview of the 1996 research agenda, the centerpiece of which is a matrix of activities to be undertaken: (iii) progress made toward developing information on all CGIAR activities at the project level, as an aid to priority setting and budgeting in the future; and (iv) the development of a new medium-term plan.

THE BROAD CONTEXT

In reviewing Center proposals and in shaping its recommendations for 1996, as well as for its work on a new mediumterm plan, TAC required a framework for decisionmaking. The principle elements guiding the CGIAR guided TAC's decisions. Accordingly, special attention was given to the vision of the CGIAR, with its emphasis on poverty, hunger, and the environment. TAC also explicitly recognized the CGIAR's concern for efficiency, and emphasized the criteria of international public goods in shaping the CGIAR's portfolio of work.

Sustainable food security through the alleviation of poverty and the protection of the environment are the overarch-



ing concerns of the CGIAR. These two goals are not independent. There are significant interactions between the two. Poverty is the agent driving much of the degradation of the agricultural environment. In the longer-term, the state of that environment will, through its impact on productivity, affect efforts to alleviate poverty. The CGIAR has concluded that its strength lies in work on important international public goods—important (in this case with significant implications for poverty and for the environment). international (because of the CGIAR's mandate and the implications for economies of scale) public goods (those on which proprietary claims are too costly to effect and which involve non-rivalrous consumption)

TAC's primary considerations for the 1996 research agenda were the likely consequences of the proposed research on poverty alleviation and protecting the environment. The gains to be achieved through expanded collaboration were also a consideration, particularly given the increasing complexity of science (and the advantages to be gained through specialization), the growing capacity of selected developing country national research systems, and the large investments made by others in related research. These considerations influenced TAC's emphasis on collaboration, including systemwide programs. which is congruent with the CGIAR's efforts toward greater openness. TAC believes this move to openness manifests a

concern for efficiency in pursuing poverty alleviation and protection of the environment.

TAC focused its attention on those international public goods in which the CGIAR has either a cost or an apparent reliability advantage. Where others, such as national programs, the private sector, or universities, have equal or lower costs, are acceptably reliable (i.e., appropriately funded and demonstrably committed), and are disposed to do the job, TAC felt the CGIAR should encourage those alternative sources of supply.

OVERVIEW OF THE 1996 RESEARCH AGENDA

The research agenda endorsed in Lucerne was based on

five undertakings, each relating directly to the overarching goals of the CGIAR: increasing productivity; protecting the environment; saving biodiversity; socioeconomic, public policy, and public management research; and strengthening NARS. As shown in Table 1 [see next page], the 1996 research agenda is built around twelve sets of activities, each of which can be related to one of the five undertakings.

Center Budgets

Centers submitted their proposed 1996 budgets to TAC in early March 1995, requesting \$21 million more in 1996 than in 1995. This increase pertained both to Center activities, as well as to systemwide activities. It does not fully reflect the demand

for financial resources by the Centers, as their requests were significantly influenced and limited by guidelines laid out by TAC and the CGIAR Secretariat that reflected an earlier decision to base 1996 proposals on 1995 allocations. Two considerations shaped that decision. First, the CGIAR has not yet finished the analysis required to translate general interests (for example, in natural resources) to specific allocations (for example, water quality) and then to a new medium-term plan. Second, TAC should, nevertheless, be receptive to requests that are clearly congruent with changes both in the CGIAR's priorities and in science, and their implications for what is possible.

As part of the CGIAR's program of renewal, efforts were



Table 1. 1996 CGIAR Research Agenda (revised)

		19%	14%	5%	1%	1%	12%	8%	12%	7%	6%	2%	2%	1%	0%	2%	2%	1%	1%	0%	100
TOTAL	298.5	56.8	40.6	15.5	2.9	2.4	35.4	24.7	37.2	20.2	19.3	6.9	6.7	1.6	8.0	4.8	6.3	3.8	4.2	0.9	298
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SNAR	9.7						1		2.8	1.7	2.1	2.9	0.2				1				9
RRI	31.2	10,1	5.5				5.5	3.1	2.8	1.8	0.8	0.9	0.4		0.30		0.10		0.70	Ţ.	31
GRI	12.9	1.5		0.0	0.2		0.9	4.2	1.6	1.0	1.9	0.5	1.1	1.60	D /					0.3	14
.RI	25.1	0.9		12.1			2.8	2.7	1.9	1.8	1.7	0.5	0.8								25
TΑ	23.3	4.8	11.4	<u>l</u>			2.1	1.5	1.1	1.3	1.1								0.70		24
И	7.6						2.6		4.9								#1141-41-111111111111111111111111111111				7
PRI	14.5								11.8	1.4	1.0		0.2				0.20		0.87	0.3	15
RISAT	27.1	6.9	5.6				7.9	0.7	2.5	1.7	1.5		0.2		0.20				0.70	0.3	28
RAF	16.8	0.9			1.3		0.8	1.8	0.7	3.0	1.5				-		5.77	1.00	0.40		17
LARM	9.3	1.6				2.4	2.7	0.8	1.0		0.9					18 1 - 18 - 17 - 10 to 1		/1007# 1/100#################################	0.30		
ARDA	17.6	3.8	2.7	1.9			2.5	2.7	1.2	1.5	0.9		0.4		-			2.00			17
P	19.0	3.7	2.7				2.9	3.1	1.0	1.1	0.7	0.5	0.5		0.00	0.00		2.80	0.15		1
IMMYT	27.7	14.1	5.3		1.4		2.0	1.4	0.3	2.2	1.7	1.5	0.2		0.30	0.80			0.10		27
IFOR	7.6	6.5	5.3	1.5	1.4		1.8 2.0	0.2	2.5	0.3	1.0	0.1	0.0			4.00	0.20		0.30		
IAT	27.5	6.61	5.3	1.5			10	2.4	0.5	1.0	1.8		2.5	1		4.00	0.20		0.30	r	27
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	1996	1				_		_					1	1		ì	Research	1 1	1996		

at In the future, this column will include a portion of what is shown under the hiddiversity column b? Allocations among Centers to be determined.

These amounts have not yet been allocated to Centers.

An earlier version of this matrix appeared as:

Table 3. 1996 CGIAR Research Agenda in The 1996 CGIAR Research Agenda -- SDR/TAC-IAR/95/10

Table 5. 1996 CGIAR Research Agenda in The Financial Requirements of the 1996 CGIAR Research Agenda--MTM/95/05



made to ensure that the distinction between core and complementary activities would become a programmatic distinction and not one based on source of funding. For the most part, with the agreement of the individual funders involved, core-like activities funded through special projects were transferred from complementary activities to the core program, where they became additions to the planning envelope.

Systemwide Programs and Initiatives

TAC received 20 proposals for support to systemwide work in 1996. Given the myriad of proposals and the variability that appeared to exist among the concepts and terms employed, TAC sought to establish

clear principles and criteria to underpin its analysis and deliberations. TAC proposed the term *systemwide initiative* to refer to the initiation or design phase of an ecoregional or globally focused activity, and the term *systemwide program* to refer to work already in progress.

Systemwide programs take advantage of potential complementarities among Centers, avoid the duplication of activities across Centers, encourage specialization by the Centers involved, and take advantage of economies of scale in activities, or spread costs more widely. In its deliberations TAC considered whether the value added through a systemwide effort, over and above what could be expected through individual

Center activities, would cover the accompanying increase in transaction costs

The 1996 research agenda includes support for seventeen systemwide initiatives and programs, including programs on livestock and water research, for a total of \$10 million in 1996. The findings of the CGIAR task forces on sustainable agriculture and ecoregional approaches to research were issued too late to be completely reflected in TAC's deliberations. They will, however, be fully taken into account as TAC focuses on planning for 1997 and beyond.

Work in support of systemwide programs is also funded directly out of Center budgets; for example, in the case of the Indo-Gangetic Plains Rice-

Wheat Program, both CIMMYT and IRRI invest core funds in the coordinated activity. To get a complete picture of the amounts committed through systemwide programs, TAC requested that Centers report on such amounts under the relevant programs and deduct the same amount from Center-oriented activities; for example, a transfer from "biodiversity" to "systemwide program on genetic resources." Centers were not able to comply immediately with that request, however, and not all commitments to the programs are shown in 1996. Only for the hillsides and rice-wheat programs are all expenditures reflected in Table 1.

The five systemwide programs that are a part of the 1996 research agenda are described briefly below:

- 1. The Alternatives to Slash and Burn Program is a worldwide research and development project. Convened by ICRAF, it has two main objectives: (i) the reclamation of deforested and degraded lands into sustainable production systems; and (ii) the prevention of further deforestation.
- 2. The Systemwide Genetic Resources Program includes the individual work of all Centers on the long-term conservation of genetic resources, in addition to the specific activi-

ties of IPGRI, the convening Center, for the program. This program does not preclude Centers from having their own genetic resources units to support their germplasm enhancement and breeding work.

- 3. The Latin American Hill-sides Program is a collaborative venture, featuring CIAT and CIMMYT, to improve farming systems, especially those involving maize, in the hillsides of Latin America.
- 4. The Sustainable Mountain Agricultural Development Program, for which CIP is the convening Center, aims

- to promote the research base for sustainable mountain development in the Andean region, the East African highlands, and the Himalayas region. ICRAF participates in this program, and the International Center for Integrated Mountain Development (ICIMOD) intends to participate.
- 5. The Indo-Gangetic Plains Rice-Wheat Program aims to form an alliance of scientific and technical experts from NARS with experts from the Centers to address major issues of sustainable production in rice wheat based farming systems in



the Indo-Gangetic Plains. ICRISAT is the convening Center, and IRRI and CIMMYT are the two lead Centers involved. They are joined by national programs in the region.

The Matrix

What emerges from the preceding discussion is a matrix with eighteen columns, of which twelve pertain to Center activities, five to systemwide programs, and one to systemwide initiatives. The last column, entitled "research program design," refers to the twelve systemwide initiatives currently in the design phase and to which a total of \$4.2 million has been assigned. The last row, labeled "others," provides information on contributions by others, mostly investments by NARS, to systemwide programs.

TAC has strongly endorsed the Systemwide Livestock Initiative and has recommended the allocation of up to \$4 million for this work in 1996. ILRI is using an innovative procedure to allocate resources, featuring a process of competitive bidding by ecoregional consortia and evaluation through an external peer review mechanism. While it is expected that parts of the program will be implemented during 1996, the selection of projects will not occur until the end of 1995.

As it is hoped that some of the programs currently under design will be implemented during 1996, the 1996 research agenda includes a fund of \$2.5 million to be allocated after TAC reviews proposals received. In addition, \$1 million has been tentatively allocated to a systemwide initiative on water management, to which TAC has assigned a high priority. An IIMI planning conference scheduled for September 1995 is expected to result in a firm research program beginning in 1996. Proposals are also expected from ICARDA on an ecoregional program for West Asia and North Africa and from CIAT on an ecoregional program for tropical America.

Resource Allocation

The changes that have taken place between 1991 and 1996 in the profile of Center and System activities are shown in Table 2 [see next page]. Here the changes are really quite

notable, indeed a testimony that the Centers are responsive to the changing needs of the CGIAR's members. While germplasm improvement has stayed near its 1991 level, production systems has declined notably, resulting in a decline in work aimed at mostly productivity themes by 12 percentage points, or over 20 percent. During the same period, investments in protecting the environment increased by 8 percentage points, or over 100 percent, in biodiversity by 4 percentage points, or nearly 70 percent, and in policy by 22 percent. Balancing that has been the reduction in strengthening NARS by 6 percentage points, or 25 percent. A change of one percentage point is equivalent to a change in funding of roughly \$3 million. TAC has concluded that there is little evidence to support a perception that the CGIAR is unresponsive to changing needs.



Table 2. CGIAR Funding Allocations

(in \$ million and percentages)

Funding for Research Agenda	<u>199</u>	<u>91</u>		Propos	ed 1996	
	(\$)	(%)	(\$)	(%)	(\$)	(%)
			(exclu	ding	(includ	ding
			transf	er of	transfe	er of
			complem	entary)	complem	entary)
<u>By Program:</u>						
1 Increasing Productivity						
1.1 Germplasm Enhancement & Breeding	48.7	21%	56.8	17%	57.1	16%
1.2 Production Systems Dev. & Mgmt. (1.2a-1.2d):						
a Cropping Systems	41.8	18%	38.6	11%	40.9	11%
b Livestock Systems	30.2	13%	15.6	5%	15.5	4%
c Tree Systems	4.6	2%	4.9	1%	4.9	1%
d Fish Systems			1.7	0%	2.4	1%
Subtotal (1.2)	76.6	33%	60.8	18%	63.7	18%
Subtotal (1)	125.3	54%	117.6	42%	120.8	40%
2 Protecting the Environment	16.2	7%	43.6	13%	48.2	13%
3 Saving Biodiversity	13.9	6%	26.9	8%	27 2	8%
4 Improving Policies	20.9	9%	32.3	9%	37.7	10%
5 Strengthening NARS						
5.1 Training	20.9	9%	19.2	6%	20.3	6%
5.2 Information/Communications	18.6	8%	18.1	5%	19.1	5%
5.3 Organization/Management Counselling	4.6	2%	6.0	2%	6.9	2%
5.4 Networks	11.6	5%	6.6	2%	6.7	2%
Subtotal (5)	55.7	24%	49.9	15%	53.0	15%
Research Program Implementation			7.5	2%	7.5	2%
Research Program Design			4.2	1%	4.2	1%
Nesealch rhogiam Design			4.2	1 /0	4.2	1 /0
TOTAL	232.0	100%	282.0	82%	298.6	82%

CENTER PROJECT INFORMATION

The formats used to explain or manage the CGIAR must ultimately rest on descriptions of work undertaken by the Centers. With most Centers now employing project-based management and the remainder moving in that direction, there is an opportunity to describe the work of the Centers in terms of projects. Currently, there are differences among Centers in the way projects are defined and described, as well as in how authority and responsibility are assigned and budgets framed. Although these differences will remain to some extent, a certain degree of standardization will be required (for example, in the definition of projects) so that activities can

be aggregated across Centers. There will be an advantage in defining projects in terms of specific outputs, time frame, and likely implications for productivity, poverty alleviation, and the environment. This added detail will permit a linkage to be made between Center projects and CGIAR programs, as illustrated in Table 3.

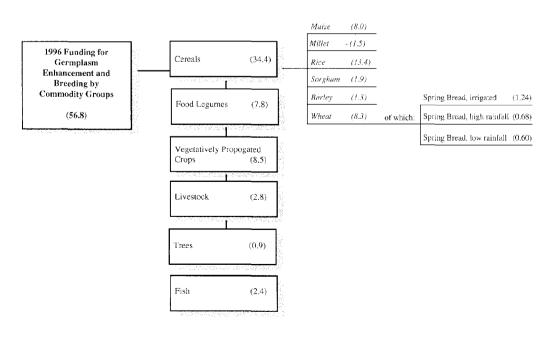
Since early 1995, TAC has been interacting with the Centers on their approaches to projects and project budgeting. TAC and the CGIAR Secretariat will establish a minimum degree of standardization required to meet the requirements of the development assistance community and the information needs of TAC and the CGIAR Sec-

retariat, while taking into account the circumstances of the Centers.

While the CGIAR as a whole has agreed to an emphasis on poverty alleviation and protecting the environment, it is still the case that many of its members have interests which are more specific. For example, some are more concerned with one set of countries or one geographic region than another. Some see one set of natural resources as of greater interest than another. Some prefer work on marginal lands over work on favored environments and vice versa. Some are more. others less, concerned with the extent of basic and strategic research. Those with such interests will welcome the pos-

Table 3. An Illustration of the Linkage between Center Projects and CGIAR Programs

(in \$ mi.lion)





sibility of aggregating activities across Centers in terms of their specific concerns. Standardized project formulation will help to make that possible.

The current matrix describes the research agenda in terms of twelve activities, each a subset of one of the five principal undertakings, and several systemwide programs. This can be continued or expanded to reflect the preferences of the CGIAR. As new opportunities and strategies are examined, new sets of information will be required, pointing to the advantage of comprehensiveness in Center management information systems.

A New Medium-Term Plan

A central theme in the renewal of the CGIAR is the balance between the financial support committed by members and the accountability of the Centers. These two elements come together around the agreed research agenda. That agenda must relate in evident ways to the overarching concern of the CGIAR-efficiency in pursuing sustainable food security through the alleviation of poverty and protection of the environment. The priorities reflected in the agenda must be demonstrably consistent with that concern. TAC will develop a framework for assessing consistency and will present a first perspective on its findings to the CGIAR at International Centers Week in October 1995. This will be part of TAC's effort to frame new priorities that are consistent with the System's current concerns as well as new opportunities through international agricultural research. It will be a step along the way to supplanting the 1994 to 1998 medium-term plan.

The priorities which currently guide resource allocation within the CGIAR emerged from analyses and deliberations undertaken from 1991 to 1993. A portfolio of activities was endorsed by the CGIAR in 1993.

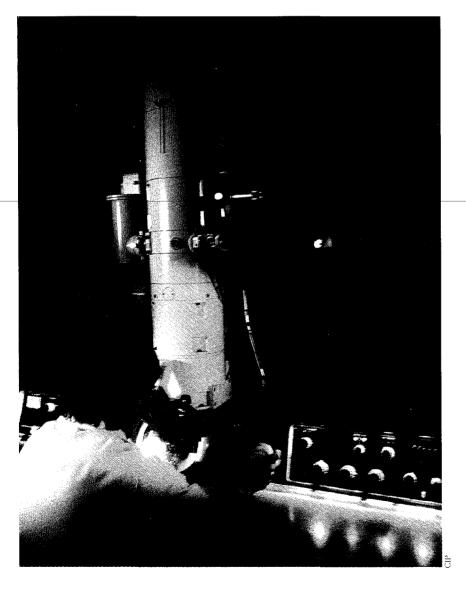
These were to shape resource allocations through 1998, when a new systemwide mediumterm plan was to be initiated. However, from 1993 to 1995 three considerations significantly affected the balance of the 1994 to 1998 portfolio: a decline in real funding; an increased importance placed on the environment; and a conviction that openness will make the CGIAR more efficient. These and other considerations have already altered the profile

of CGIAR activities. Resource allocation may be further reshaped through a new medium-term plan. TAC believes that there are ways to more explicitly incorporate the System's overarching concerns in the new recommendations on resource allocation.

Planning horizons for agricultural research are long ones, several years in duration, and the Centers and TAC want to plan agendas in terms of longterm perspectives. Even so, over the course of those horizons, external circumstances can change sufficiently to suggest rebalancing the agenda. In the case of the CGIAR, two considerations have been especially important in the recent past: one relating to total support, the other to the changing interests of members. A third consideration, changes in science, can also suggest the need for rebalancing agendas.

The shorter the planning horizon, the easier it is to maintain congruency with the external environment, but the more difficult it is to be efficient in the use of resources, and the more energies that go into planning itself. The CGIAR tried a five-year horizon, but found plans soon losing touch with the external environment. At this time, and in the spirit of compromise between shorter and longer horizons, the CGIAR has adopted a three-year horizon with periodic reviews of the external environment, offering the possibility of mid-course corrections. This will, in effect, create a three-year, moving horizon guided by the longer horizons required by research, with agendas being rebalanced when required by changes in the external environment.

TAC will establish priorities for the purpose of framing a new medium-term plan. In doing so, TAC has already expressed its view that certain themes merit more considera-



tion. In particular, it appears advantageous to give more attention to alternative sources of supply for the products of the Centers and to further assess the likely success of the activities in which the Centers engage.

In order to better portray to the CGIAR its options with respect to poverty alleviation, TAC will assess the sensitivity of priorities to one or more measures of poverty; for example, priorities based on all developing countries compared with those based on only the poorest countries.

TAC notes the importance given to the greater participation

of NARS in the deliberations of the CGIAR. There are several levels at which such participation might occur; for example, at the System level, at the TAC level, where insight into the potential role of NARS as alternative sources of supply is especially important, at the Center level, and at the project level. TAC has met three times with representatives of NARS: with African NARS at WARDA in 1994: with NARS from around the world in Rome in late 1994: and with NARS from the Western Hemisphere at CIP in early 1995. TAC is impressed with the potential utility of such meetings, expects to continue them on a regular basis, and,

along with others, is looking for ways to make them more productive

TAC is also actively exploring how the CGIAR can best assess expertise provided by advanced research institutes. Doing so will require far greater familiarity with their work. TAC is studying ways to achieve that end.

TAC will help to facilitate the CGIAR's discussions on the future research agenda at International Centers Week in October 1995. TAC fully recognizes its advisory role in framing priorities and in shaping research resource allocations.



To be effective, TAC must depend on guidance from members and from other stakeholders. The aim of TAC is to support the deliberations at International Centers Week and

beyond, with TAC relating the effects of various views on pironities and various perceptions of what is likely, given the expected state of the art in science, to the patterns of resource

allocations that might result Such information will help orient the discussions at International Centers Week on the development of a new mediumterm plan

CGIAR RESEARCH AND PRINCIPAL RELATED ACTIVITIES

Increasing Productivity

Germplasm enhancement and breeding Production systems development and management

Protecting the Environment

Ecosystems analysis, ecological characterization, and environmental concerns Biology and ecology of useful organisms and pests

Land resources conservation and management

Aquatic resources conservation and management

Processes and mechanisms of sustainable resource systems

Modeling of landscape and watershed level phenomena

Saving Biodiversity

Germplasm collection, conservation, characterization, and evaluation

Socioeconomic, Public Policy, and Public Management Research

Economic and social analysis
Policy analysis
Governance and management of public systems, including irrigation systems
Research on organization and management of institutes

Strengthening National Programs

Training and conferences

Documentation, publication, and dissemination of information
Institution building—advice to NARS
Networks

SYSTEMWIDE INITIATIVES

Agricultural Research Indicators Initiative

Ecoregional Approach to Enhancing Agricultural Research in Tropical America

Ecoregional Approach to Research and Development in the Humid/Subhumid Tropics and Subtropics of Asia

Ecoregional Initiative for On-Farm Water Husbandry in West Asia and North Africa

Ecoregional Program for the Warm Humid and Subhumid Tropics of Sub-Saharan Africa

Desert Margins Initiative

Property Rights and Collective Action

Soil, Water, and Nutrient Management Initiative

Systemwide Coastal Environment Initiative

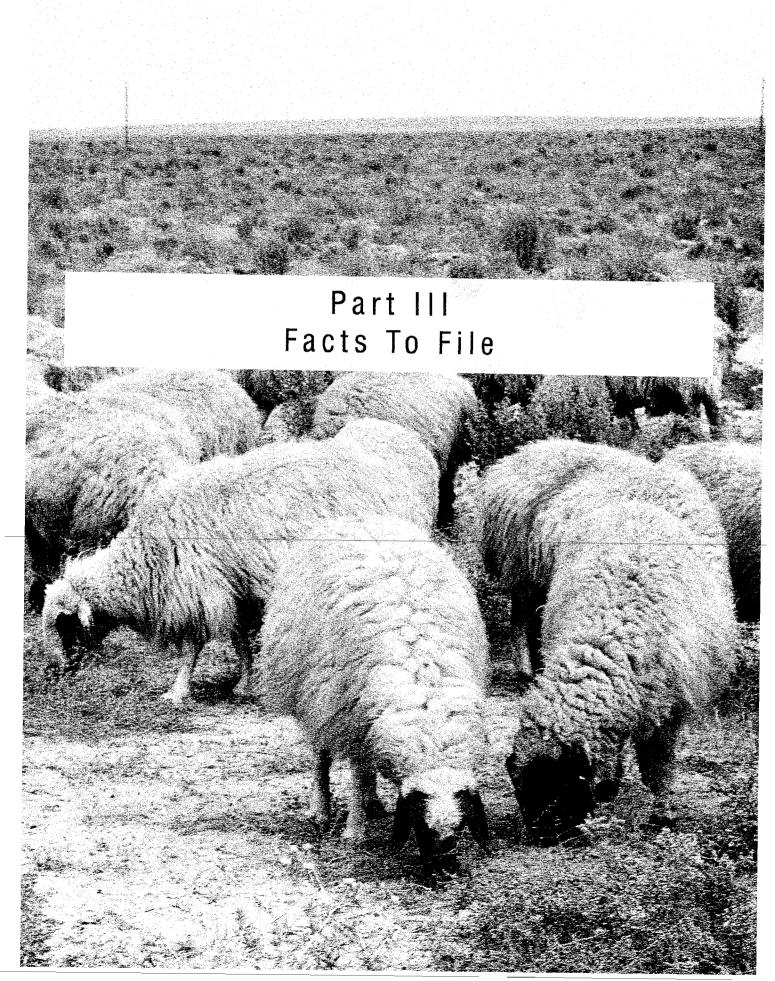
Systemwide Integrated Pest Management Initiative

Systemwide Livestock Initiative

Systemwide Water Resources Management Program



2



CGIAR Center Profiles



Centro Internacional de Agricultura Tropical—CIAT

(International Center for Tropical Agriculture)

Headquarters: Cali, Colombia Board Chair: Lucia de Vaccaro

Director General: Gustavo Nores (until July 31, 1994); Robert D. Havener (August 1994 to June 30, 1995);

Grant Scobie (from July 1995)

Founded: 1967

Focus: To contribute to the alleviation of hunger and poverty in tropical countries by applying science to the generation of technology that will lead to lasting increases in agricultural output while preserving the natural resource base. Research is conducted on germplasm development of beans, cassava, tropical forages, and rice for Latin America and on resource management in humid agroecosystems in tropical America, including hillsides, forest margins, and savannas.



Centro Internacional de Mejoramiento de Maiz y Trigo—CIMMYT

(International Center for the Improvement of Maize and Wheat)

Headquarters: Mexico City, Mexico

Board Chair: Burton Matthews (until April 14, 1994);

Louisa van Vloten-Doting (from April 15, 1994)

Director General: Donald Winkelmann (until December 1994); Roger Rowe (January 1, 1995 to September 30, 1995); Timothy Reeves (from October 1, 1995)

Founded: 1966

Focus: To help the poor by increasing the productivity of resources committed to maize and wheat in developing countries, while protecting the environment, through agricultural research and in concert with national research systems.



CIFOR Center for International Forestry Research—CIFOR

Headquarters: Bogor, Indonesia Board Chair: Bo Bengtsson Director General: Jeffrey Sayer

Founded: 1992

Focus: To contribute to the sustained well-being of people in developing countries, particularly in the tropics, through collaborative strategic and applied research in forest systems and forestry, and by promoting the transfer of appropriate new technologies and the adoption of new methods of social organization for national development.



Centro Internacional de la Papa—CIP

(International Potato Center)

Headquarters: Lima, Peru

Board Chair: Lindsay Innes (until April 30, 1995);

Martha ter Kuile (from May 1, 1995) Director General: Hubert Zandstra

Founded: 1971

Focus: To contribute to increased food production, the generation of sustainable and environmentally sensitive agricultural systems, and improved human welfare by conducting coordinated, multidisciplinary research programs on potato and sweet potato, by carrying out worldwide collaborative research and training, by catalyzing collaboration among countries in solving common problems, and by helping scientists worldwide to respond flexibly and successfully to changing demands in agriculture.



International Center for Agricultural Research in the Dry Areas—ICARDA

Headquarters: Aleppo, Syria

Board Chair: Enrico Porceddu (until March 31, 1994);

Alfred Bronnimann (from April 1, 1994)

Director General: Nasrat Fadda (until January 31, 1995);

Adel El-Beltagy (from February 1, 1995)

Founded: 1977

Focus: To meet the challenge posed by a harsh, stressful, and variable environment in which the productivity of winter rainfed agricultural systems must be increased to higher sustainable levels, in which soil degradation must be arrested and possibly reversed, and in which water use efficiency and the quality of the fragile environment need to be ensured. ICARDA has a world responsibility for the improvement of barley, lentil, and faba bean, and a regional responsibility in West Asia and North Africa for the improvement of wheat, chickpea, forage, and pasture—with emphasis on rangeland improvement and small ruminant management and nutrition—and of the rainfed farming systems associated with these crops—with emphasis on on-farm water-use efficiency.



RAF International Centre for Research in Agroforestry—ICRAF

Headquarters: Nairobi, Kenya

Board Chair: George Holmes (until March 18, 1994);

David B. Thorud (from March 19, 1994) Director General: Pedro A. Sanchez

Founded: 1977

Focus: To mitigate tropical deforestation, land depletion, and rural poverty through improved agroforestry systems. Trees in farming systems can increase and diversify farmer income, make farming systems more robust, reverse land degradation, and reduce the pressure on natural forests. ICRAF carries out research with national agricultural and forestry research systems, nongovernmental organizations, and other research partners, and is focused on two major thrusts: finding alternatives to slash and burn agriculture in the humid tropics; and overcoming land depletion in subhumid and semi-arid Africa.



International Center for Living Aquatic Resources Management—ICLARM

Headquarters: Makati, Metro Manila, The Philippines Board Chair: John L. Dillon

Director General: Laurence Stifel (until April 1, 1994); Meryl J. Williams (from April 5, 1994)

Founded: 1977

Focus: To improve the production and management of aquatic resources, for sustainable benefits to present and future generations of low-income producers and con sumers in developing countries, through international multidisciplinary research in partnership with national agricultural research systems. The declining state and threatened sustainability of fisheries, due to overfishing exacerbated with poverty and pollution, and the potential for increases in aquaculture production call for research which includes understanding of the dynamics of coastal and coral reef resource systems and of integrated agriculture-aquaculture systems, investigating alternative management schemes in these systems, and improving the productivity of key species.



International Crops Research Institute for the Semi-Arid Tropics—ICRISAT

Headquarters: Patancheru, Andhra Pradesh, India

Board Chair: Eric H. Roberts Director General: James G. Ryan

Founded: 1972

Focus: To conduct research leading to enhanced sustainable food production in the harsh conditions of the semi-arid tropics. ICRISAT's main crops—sorghum, finger millet, pearl millet, chickpea, pigeonpea, and groundnut—are not generally known in the world's more favorable agricultural regions, but they are vital to life for the one-sixth of the world's population that lives in the semi-arid tropics. ICRISAT conducts research in partnership with national agricultural systems that encompasses the management of the region's limited natural resources to increase the productivity, stability, and sustainability of these and other crops.



International Food Policy Research Institute—IFPRI

Headquarters: Washington, D.C., USA

Board Chair: Gerry Helleiner (until December 31, 1994);

David Bell (from January 1, 1995)

Director General: Per Pinstrup-Andersen

Founded: 1975

Focus: IFPRI was established to identify and analyze alternative national and international strategies and policies for meeting the food needs of the developing world on a sustainable basis, with particular emphasis on lowincome countries and on the poorer groups in those countries. While IFPRI's research is specifically geared to contributing to the reduction of hunger and malnutrition, the factors involved are many and wide-ranging, requiring analysis of underlying processes and extending beyond a narrowly defined food sector. IFPRI collaborates with governments and private and public institutions worldwide interested in increasing food production and improving the equity of its distribution. Research results are disseminated to policymakers, administrators, policy analysts, researchers, and others concerned with national and international food and agricultural policy.



International Irrigation Management Institute—IIMI

Headquarters: Pelawatte via Colombo, Sri Lanka Board Chair: M.S. Swaminathan (until December 31, 1994); Les Swindale (from January 1, 1995)

Director General: Roberto Lenton (until December 31, 1994); Randy Barker (from January 1, 1995 to August 31, 1995); David Seckler (from September 1, 1995)

Founded: 1984

Focus: IIMI's mission is to foster improvement in the management of water resource systems and irrigated agriculture. IIMI conducts a worldwide program to generate knowledge to improve water resource systems and irrigation management, to strengthen national research capacity, and to support the introduction of improved technology, policies, and management approaches.



International Institute of Tropical Agriculture—IITA

Headquarters: Ibadan, Nigeria

Board Chair: Randy Barker (until April 30, 1994);

Pierre Dubreuil (from May 1, 1994) Director General: Lukas Brader

Founded: 1967

Focus: IITA conducts research and outreach activities, with partner programs in countries of Sub-Saharan Africa, to help those countries increase food production on an ecologically sustainable basis. IITA seeks to improve the food quality, plant health, and postharvest processing of its mandated crops—cassava, maize, cowpea, soybean, yam, and banana and plantain—while strengthening national research capabilities.



International Livestock Research Institute—ILRI

Headquarters: Nairobi, Kenya Board Chair: Neville P. Clarke Director General: Hank Fitzhugh

Founded: 1995

Focus: To increase animal health, nutrition, and productivity—milk, meat, and traction—by removing constraints to tropical livestock production, particularly among small-scale farmers; to protect environments supporting animal production against degradation by tailoring production systems and developing technologies that are sustainable over the long-term; to characterize and conserve the genetic diversity of indigenous tropical forage species and livestock breeds; and to promote equitable and sustainable national policies for the development of animal agriculture and the management of natural resources affected by animal production, encouraging, in particular, those policies that support strategies for reducing hunger and poverty, for improving food security, and for protecting the environment.



International Plant Genetic Resources Institute—IPGRI

Headquarters: Rome, Italy

Board Chair: Lauritz Holm-Nielsen (until March 25,

1994); Wanda Collins (from March 31, 1994)

Director General: Geoffrey C. Hawtin

Founded: 1974

Focus: To encourage, support, and engage in activities to strengthen the conservation and use of plant genetic resources worldwide, with special emphasis on developing countries, by undertaking research and training and by providing scientific and technical information.



International Rice Research Institute— IRRI

Headquarters: Manila, The Philippines

Board Chair: Walter Falcon (until December 31, 1994);

Emil Q. Javier (from January 1, 1995)

Director General: Klaus Lampe (until March 1995);

George Rothschild (from April 1, 1995)

Founded: 1960

Focus: To improve the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes, by generating and disseminating rice-related knowledge and technology of short- and long-term environmental, social, and economic benefit and by helping to enhance national rice research.



International Service for National Agricultural Research—ISNAR

Headquarters: The Hague, The Netherlands

Board Chair: Nicole Scnécal (until September 30, 1994); Charles Edward Hess (from October 1, 1994)

Director General: Christian Bonte-Friedheim

Founded: 1979

Focus: To help developing countries bring about sustained improvements in the performance of their national agricultural research systems and organizations. ISNAR does this by supporting their efforts in institutional development, promoting appropriate policies and funding for agricultural research, developing or adapting improved research management techniques, and generating and disseminating relevant knowledge and information.



West Africa Rice Development Association—WARDA

Headquarters: Bouaké, Côte d'Ivoire

Board Chair: Just Faaland

Director General: Eugene R. Terry

Founded: 1970

Focus: WARDA's work is aimed at strengthening the capability of agricultural scientists in West Africa for technology generation to increase the sustainable productivity of intensified rice-based cropping systems in a manner that improves the well-being of resource poor farm families and that conserves and enhances the natural resource base. Research covers rice grown in mangrove swamps, inland valleys, upland conditions, and irrigated conditions.



Who's Who in the CGIAR



CGIAR Chairman

Ismail Serageldin Vice President, Environmentally Sustainable Development World Bank

Cosponsors and Their Representatives

Food and Agriculture Organization of the United Nations United Nations Development Programme United Nations Environment Programme World Bank

Henri Carsalade Timothy Rothermel Jaime Hurtubia Michel Petit

CGIAR Executive Secretary

Alexander von der Osten

TAC Chair

Donald Winkelmann

TAC Secretariat Officer-in-Charge

Guido Gryseels

TAC Members

A. Berkaloff
Hosny El-Lakany¹
Hans M. Gregersen
Ken-Ichi Hayashi²
Ted Henzell
E. A. Huisman
A. Kainuma³
Uma Lele¹

Eugenia Muchnik de Rubenstein Richard Sylvester Musangi

Sir Ralph Riley Ammar Siamwalla P. M. Tigerstedt

Saydil-Moukhtar K. Toure

Maria José de Oliveira Zimmermann

Finance Committees

World Bank, Chair IFAD³
Australia India³
Brazil⁴ Japan
Canada The N

Canada The Netherlands⁴
Denmark⁴ The Philippines⁴
Egypt⁴ United Kingdom
Germany

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Oversight Committee

Paul Egger, Chair (Switzerland)

Henri Carsalade (FAO)4

V. L. Chopra (India)

Robert W. Herdt (Rockefeller

Foundation)

Johan Holmberg (Sweden)

John Lewis (USA)

Manuel M. Lantin (The Philippines)³

Cyrus Ndiritu (Kenya)3

Genetic Resources Policy Committee

M. S. Swaminathan, Chair

Bo Bengtsson

Jurg Benz Robert Bertram Adel El-Beltagy Geoffrey Hawtin

George Rothschild

Maria José de Oliveira Zimmermann

CGIAR Members

Countries

Australia Austria

Belgium Brazil

Canada China Colombia²

Côte d'Ivoire^s Denmark

Egypt⁸ Finland France

Germany India Indonesia

Iran⁸ Ireland Italy

Japan Kenya^{*} Korea Luxembourg

Mexico The Netherlands

Nigeria

Norway
The Philippines
Romania⁸

Romania⁸ Russian Federation

Spain Sweden Switzerland

United Kingdom

United States of America

Foundations

Ford Foundation

International Development Research Centre

Kellogg Foundation Rockefeller Foundation

International and Regional Organizations

African Development Bank

Arab Fund for Economic and Social Development

Asian Development Bank European Commission

Food and Agriculture Organization of the United Nations

Inter-American Development Bank

International Fund for Agricultural Development

Opec Fund for International Development

United Nations Development Programme

United Nations Environment Programme

World Bank

Regional Representatives

Africa

Asia and the Pacific

Europe

Ghana and Morocco India and Western Samoa

The Czech Republic

and Israel

1994

Chile and Latin America and

Trinidad and Tobago the Caribbean Iran and Tunisia Middle East and

North Africa

1995

Ghana and Zimbabwe Malaysia and Nepal The Czech Republic

and Estonia

Chile and El Salvador

Egypt and Iran

CGIAR Chairmen, 1971-1995

Ismail Serageldin 1994-Present V. Rajagopalan 1991-1993 Wilfried Thalwitz 1990-1991 1987-1990 W. David Hopper S. Shahid Husain 1984-1987 Warren Baum 1974-1983 Richard H. Demuth 1971-1974

CGIAR Executive Secretaries, 1972-1995

Alexander von der Osten 1989-Present Curtis Farrar 1982-1989 Michael Lejeune 1975-1982 1972-1975 Harold Graves

TAC Chairs, 1971-1995

Donald Winkelmann	1994-Present
Alex McCalla	1988-1994
Guy Camus	1982-1987
Ralph Cummings	1977-1982
Sir John Crawford	1971-1976

TAC Executive Secretaries, 1971-1995

Guido Gryseels9 1994-Present 1985-1994 John Monyo Alexander von der Osten 1982-1985 Philippe Mahler 1976-1982 Peter Oram 1971-1976



^{&#}x27;On leave of absence from April 1995 until October 1995.

Departed the Committee in 1994.

Joined the Committee in 1995.

Departed the Committee in 1995.

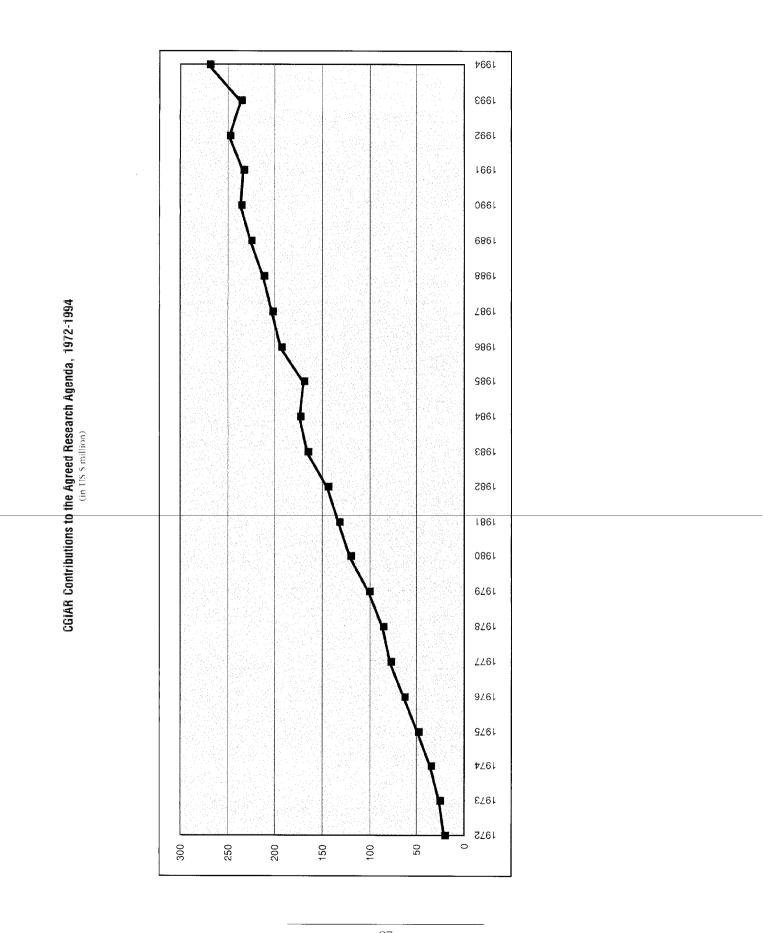
Members serve in their institutional capacities.

[&]quot;Members serve in their personal capacities.

Joined the CGIAR in 1994.

Soined the CGIAR in 1995.

Officer-in-Charge.



CGIAR Contributions to the Agreed Research Agenda by Member, 1972-1994 (in 8 million)

					***************************************								<u> </u>											
Industrialized Countries	1972	1973	1974	1975	1976	1977	1978	1979	1980	. 1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Total
AUSTRALIA Austria		0.0	1.0	1.2	1.7	1.8	2.6	2.7	3.0	3.3	3.8	4.1	4.0	4.2	1.0	1.0	3.1 1.0	1.0	3.8 1.0	3.2 1.0	1.1	1.5	4.8 1.5	67.9 10.0
BELGIUM	0.1	0.6	0.4	0.6	1.7	2.3	2.7	3.1	3.3	2.4	1.9	1.9	1.7	2.0	1.8	2.7	2.5	2.5	3.2	3.3	3.3	2.5	3.6	50.1
CANADA	1.2	1.8	4.7	4.3	5.4	6.8	7.4	7.5	6.9	7.5	8.3	9.9	10.0	9.7	10.7	11.8	13.8	14.4	15.4	15.7	17.6	15.8	15.3	221.7
DENMARK	0.3	0.2	0.4	0.4	0.5	0.6	0.8	1.0	1.2	1.1	1.0	1.0	1.2	1.1	1.7	2.3	2.5	2.6	3.6	3.4	4.9	4.8	7.3	43.7
FINLAND													0.5	0.6	1.0	2.3	2.7	5.2	5.3	5.9	1.0	0.2	0.5	25.3
FRANCE			0.1	0.4	0.5	0.4	0.3	0.7	0.9	8.0	0.9	1.0	0.9	1.2	2.1	3.2	3.3	3.6	4.1	4.1	4.9	3.2	3.9	40.6
GERMANY	ļ	1.8	3.0	3.9	4.5	5.4	6.8	8.5	10.1	8.4	7.8	7.9	6.7	6.2	8.0	10.4	10.8	11.2	11.2	11.0 0.3	13.7	13.3	16.6	187.1 5.7
ITALY					0.1	0.0	0.1	0.1	0.2	1.0	0.2 1.6	0.3 6.1	6.6	0.4 6.5	0.6 8.3	0.7 10.1	0.2 8.1	9.5	0.3 6.1	6.1	0.3 5.8	3.9	0.6 2.8	83.5
JAPAN	0.1	0.2	0.3	0.7	1.2	2.5	3.5	4.8	7.0	8.1	8.9	9.1	9.7	11.1	15.9	18.0	20.2	19.9	23.2	23.7	26.9	32.6	36.4	283.9
LUXEMBOURG	0.,	-0.2				2.10					2.5.									0.3	• • •	0.1	0.2	0.5
THE NETHERLANDS	0.4	0.4	0.6	1.2	1.5	1.7	1.8	2.4	2.6	3.0	3.2	3.6	3.3	3.8	6.7	5.6	6.3	5.5	6.9	6.5	7.6	8.3	11.5	94.3
NEW ZEALAND					0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									0.3
NORWAY	0.8	0.2	0.4	0.8	1.1	1.5	1.9	2.0	2.0	1.9	1.9	2.2	1.9	2.3	3.1	3.2	3.9	4.1	4.7	4.7	5.8	4.7	5.4	60.4
RUSSIAN FEDERATION					1.0	1.0			-	ļ	ļ	1.5	1 - 1 -										0.2	0.2 5.0
SAUDI ARABIA Spain	-		-		1.0	1.0		<u> </u>		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	7.4
SWEDEN	1.0	0.2	1.5	2.3	2.3	2.2	2.7	3.1	3.4	3.3	3.2	3.1	3.1	3.0	4.2	4.9	5.4	5.5	6.2	6.1	8.6	6.2	8.4	89.8
SWITZERLAND	5	0.4	0.1	0.5	0.9	1.2	1.4	1.9	2.5	2.6	2.8	4.9	6.7	5.2	7.1	7.7	9.6	9.5	9.4	10.2	10.6	9.2	12.9	117.0
UNITED KINGDOM	0.7	1.1	1.9	2.4	2.9	3.5	4.8	6.4	6.8	6.0	6.3	5.9	5.7	6.3	8.4	10.3	11.5	10.9	11.6	11.6	11.1	9.4	9.8	155.2
USA	3.8	5.4	6.8	10.8	14.9	18.1	21.1	24.8	29.0	35.0	40.8	44.6	45.3	45,2	46.3	40.2	42.2	44.1	45.1	45.6	48.1	40.5	32.3	729.9
Subtotal	8.2	12.3	21.2	29.6	40.2	49.1	57.8	69.0	79.4	85.2	92.9	107.5	109.7	109.2	131.7	137.7	147.6	153.8	161.4	163.1	176.3	161.7	174.8	2,279.6
Developing Countries										İ														
BRAZIL	J]				1.0	0.5		0.7	0.0	0.1	0.0	0.1	0.5	0.5	0.5	1.2
CHINA COTE D'IVOIRE					ļ								0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	4.5 0.0
COLDMBIA																							1.2	1.2
EGYPT																								0.0
INDIA										0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	7.0
INDONESIA																						0.5	0.1	0.6
IRAN					2.0	2.0	1.0																	0.0
KOREA									-	-										0.5	0.5	0.5	0.5	2.0
MEXICO									0.5	1.0	0.1	0.2	1.2	0.4	0.2	0.1				0.1	0.0	0.0	0.5	3.7
NIGERIA				0.6	0.6	0.6	0.8	0.8	2.0	1.1	1.1	1.0	1.0	0.9	0.2	0.2	0.1	0.0	0.1	0.1	0.0	0.0		11.4
THE PHILIPPINES									0.2	0.5	0.5	0.4	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	4.1
Subtotal	0.0	0.0	0.0	0.6	2.6	2.6	1.8	0.8	2.6	3.1	2.2	2.0	4.5	2.4	1.6	1.3	1.2	1.0	1.1	1.8	1.8	2.3	3.1	40.7
<u>Foundations</u>																						[
FORD	5.3	3.7	3.0	2.8	2.0	1.6	1.0	1.0	1.3	1.3	0.8	1.3	1.0	0.9	0.9	0.9	0.8	0.8	0.9	1.2	1.8	2.3	3.1	39.6
KELLOGG Kresge	0.2	0.3	0.3	0.3	0.3	0.3	0.3					0.6	0.3											2.9 0.8
LEVERHULME TRUST	0.0								0.5	0.6	0.7	0.8	0.8	0.6	0.6				-					4.5
ROCKEFELLER	4.0	4.5	3.5	2.9	2.2	1.6	1.3	1.2	1.6	1.0	0.8	0.5	0.5	0.8	0.9	0.9	0.9	1.9	1.7	0.9	1.5	0.9	1.3	37.2
SASAKAWA 1																							0.3	0.3
Subtotal	10.2	8,5	6.8	6.0	4.5	3.5	2.6	2.2	3.4	2.9	2.3	3.2	2.6	2.3	2.5	1.8	1.7	2.7	2.7	2.1	3.2	3.1	4.6	85.3
International & Regional Organization	S														1									
ADB				0.3		0.5		0.7										0.0	0.6	0.3	0.8	0.2	0.6	4.1
AIDB Arab fund						0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.3	0.6	0.7	0.7	0.5	1.2	0.6	0.2	0.7	1.5	8.9 7.0
CFC 1/				-		0.3	0.3		0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5		0.6	0.6	0.7	1.3	0.0
EC	-					2.5	2.2	3.8	4.5	4.3	4.7	5.2	4.7	6.6	7.1	9.1	9.2	11.8	15.4	13.5	13.3	12.1	14.7	144.8
IDB			2.0	4.1	5.0	5.7	6.2	6.2	6.7	7.4	8.1	8.2	8.7	8.2	9.4	10.3	10.5	11.1	10.5	6.3	5.1	5.1	6.2	151.0
IDRC	0.2	0.3	0.6	1.0	1.8	1.3	1.0	0.8	1.5	1.0	1.2	1.8	1.0	1.3	1.2	0.8	0.6	0.6	0.8	0.5	0.9	0.5	1.1	22.0
IFAD					\Box			1.6	3.6	5.9	5.9	8.4	7.0	3.2	0.5	0.3	0.3	0.5	0.5	0.4	0.4	0.6	0.4	39.3
OPEC	0.0	1.0	1.5		1.0	- 2 -	4.4	4.0	0.9	1.1	3.6	2.3	2.2	1.0	0.5	0.5	0.3	0.3	6.7	0.1	0.1	0.1	0.2	13.1 127.9
UNDP	0.9	1.0	1.5	2. <u>2</u> 0.6	1.9	3.5 0.3	4.4	4.0 0.2	4,6	5.2	6.2 0.2	6.9 0.1	8.1 0.0	7.5	8.4	8.7	9.0	7.5	6.3	6.6	0.0	7.3	9.5	2.1
WORLD BANK	1.3	2.8	2.4	3.2	6.5	7.9	8.7	10.2	12.0	14.6	16.3	19.0	24.3	28.1	28.4	30.0	30.D	33.3	34.3	35.1	37.6	40.0	50.0	475.9
Subtotal	2.3	4.1	6.5	11.4	15,6	22.0	22,9	27,4	34.2	39.8	46.5	52.0	56.3	56.1	56.4	60.7	61.0	67.0	69.7	65.1	66.0	67,6	85.6	996.0
Total	20.7	25.0	34.5	47.5	62.9	77.2	85.0	99.5	119.6	130.9	143.8	164.7	173.2	170.1	192.2	201.6	211.5	224.5	234.9	232.0	247.3	234.7	268.1	3,401.6
If Non-CGIAR donor.																								
	·		<u> </u>						******				***************************************			~~~~~~~	***************************************							

CGIAR Contributions to the Agreed Research Agenda by Center, 1972-1994 $^{\rm I}$ $_{\rm (in~\$ million)}$

ſ		. 6 1415559		7.45 (17.55)	r															68 1 Sand				
Center	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Total
CIAT	4.3	6.1	5.5	6.0	6.3	9.5	11.7	13.4	15.0	16.2	18.6	21.7	23.5	21.2	22.0	24.1	24.4	28.4	27.7	27.9	26.9	25.3	28.9	414.5
CIFOR		!																			3.2	5.1	5.8	14.1
CIMMYT	5.0	6.3	6, 1	7.6	8.7	10.1	12.7	14.9	16.6	18.4	18.3	17.5	20.7	19.4	21.3	23.3	25.9	27.9	27.1	26.6	26.1	23.1	27.2	410.8
CIP	0.5	1.3	2.2	2.7	4.1	5.6	5.4	7.1	7.7	9.0	9.6	10.1	9.7	10.2	13.3	12.8	17.8	18.6	16.9	17.1	15.3	14.7	18.8	230.6
ICARDA					1.5	4.6	7.5	10.1	11.8	13.1	15.0	19.7	21.0	17.8	18.0	18.3	17.3	18.4	18.7	19.5	17.9	16.2	18.3	284.8
ICLARM																					4.5	3.8	4.8	13.1
ICRAF															_						11.1	11.2	15.5	37.8
ICRISAT	0.3	2.7	3.8	6.1	6.8	9.8	12.6	11.8	12.3	13.0	15.9	21.0	21.0	20.3	25.0	26.2	26.0	30.1	31.5	29.4	27.3	26.0	27.6	406.6
IFPRI				0.3	0.8	1.2	1.6	1.9	2.5	2.8	3.1	3.8	4.3	4.4	4.9	6.0	8.7	8.8	9.1	8.9	8.3	8.1	9.3	98.6
((Mi																					6.4	6.1	7.3	19.8
IITA	6.4	6.1	6.7	8.5	9.4	10.7	14.9	15.7	15.5	15.5	18.8	19.9	20.9	20.4	21.1	19.9	21.1	22.0	22.5	22.4	21.7	20.8	24.1	385.2
iLRI ²			1.0	3.7	8.9	11.9	15.2	16.2	18.9	18.5	16.9	19.8	21.9	22.5	25.8	25.7	29.1	33.7	33.8	32.9	28.4	22.2	25.0	432.1
IPGRI ³				0.5	0.9	1.3	1.7	2.4	3.0	3.0	3.6	3.6	4.0	4.2	5.1	5.5	5.9	7.1	7.0	8.1	10.8	10.4	14.0	102.1
IRRI	3.0	3.1	6.0	8.5	9.7	12.0	12.4	13.8	15.9	17.2	19.5	20.2	19.7	21.0	24.2	24.9	26.5	26.6	29.8	29.8	28.6	26.3	28.2	426.7
ISNAR									1,1	2.2	2.3	3.0	3.3	3.7	4.5	5.6	6.8	7.5	7.0	7.6	7.0	6.1	6.4	74.0
WARDA			0.5	0.6	0.8	1.3	1.9	1.8	2.5	2.0	2.2	2.8	2.0	2.5	3.1	4.2	5.4	6.1	6.2	6.7	5.6	5.4	6.7	70.1
Subtotal	19.5	25.7	31,7	44.4	58.0	77.9	97.6	109.1	122.8	130.9	143.9	163,0	172.0	167.6	188.4	196.3	214.9	235.2	237.4	236.7	249.2	230.6	268.1	3,420.9
Stabilization Fund												1.7	1.0	2.6	3.8	5.3	-3.4	-10.7	-2.5	-4.7	-1.9	4.1		-4.8
Total	19.5	25.7	31.7	44.4	58.0	77.9	97.6	109.1	122.8	130.9	143.9	164.7	173.0	170.2	192.2	201.6	211.5	224.5	234.9	232.0	247.3	234.7	268.1	3,416.1

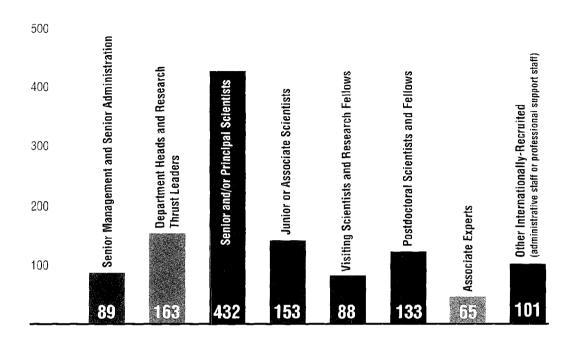
^{1/} Figures shown for 1972-1980 are total expenditures (operations) capital) and may be higher or lower than the contributions for that year (due to the accounting convention followed in the 1970s).

^{2/} Formerly ILCA and ILRAD

^{3/} Formerly IBPGR and INIBAP

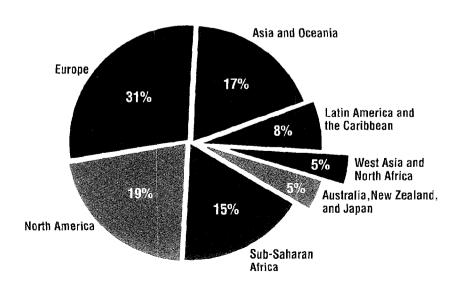
Center Internationally-Recruited Staff, 1994

(total: 1,224)



Nationality of Internationally-Recruited Staff, 1994

(percent of total)



Epilogue

responsible for future generations, or will we try to act as true stewards of the Earth and its peoples? Together, let us think of the unborn, remember the forgotten, give hope to the forlorn, reach out to the unreached, and, by wise actions today, lay the foundations for better times ahead. Let our deeds benefit not only the men and women of today, but also sustain the children who will be the men and women of tomorrow.

Ismail Serageldin, Chairman, CGIAR

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